NAVAL FIGHTERS NUMBER THIRTY - NINE

CONVAIR MODEL 48

COIN CHARGER

BY STEVE GINTER WITH HOWIE AUTEN,
JOHNNY KNEBEL, AND JIM FINK

FRONT COVER:
The Convair Model 48 Charger in its original configuration. (via SDAM)
BACK COVER:
Top, in-flight photo of the Charger in its original configuration. Bottom, Jim Fink stands in front of the modified Charger and weapons display.

At right, the Charger mock-up illustrates the extremely short wings that the original RFP required along with the flying slab horizontal tail designed to give the Model 48 the pitch-up moment needed to get in and out of unimproved airstrips. At left, first flight envelope. (via Jonny Knebel)

CONTRIBUTORS
Howie Auten, Jim Fink, Craig Kaston, Johnny Knebel, Wayne Morris, Stan Piet (Martin Mus.), and Nick Williams. This project would not have been possible without the support provided by Ron Bulinski, Bill Chana and Ray Wagner of the San Diego Aero Space Museum and the recollections of the three main players; Jim Fink, Johnny Knebel and Howie Auten.

Anyone having photos or other information on this, or any other naval or marine aircraft, may submit them for possible inclusion in future issues. Any material submitted will become the property of NAVAL FIGHTERS unless prior arrangement is made. Individuals are responsible for security clearance of any material before submission.

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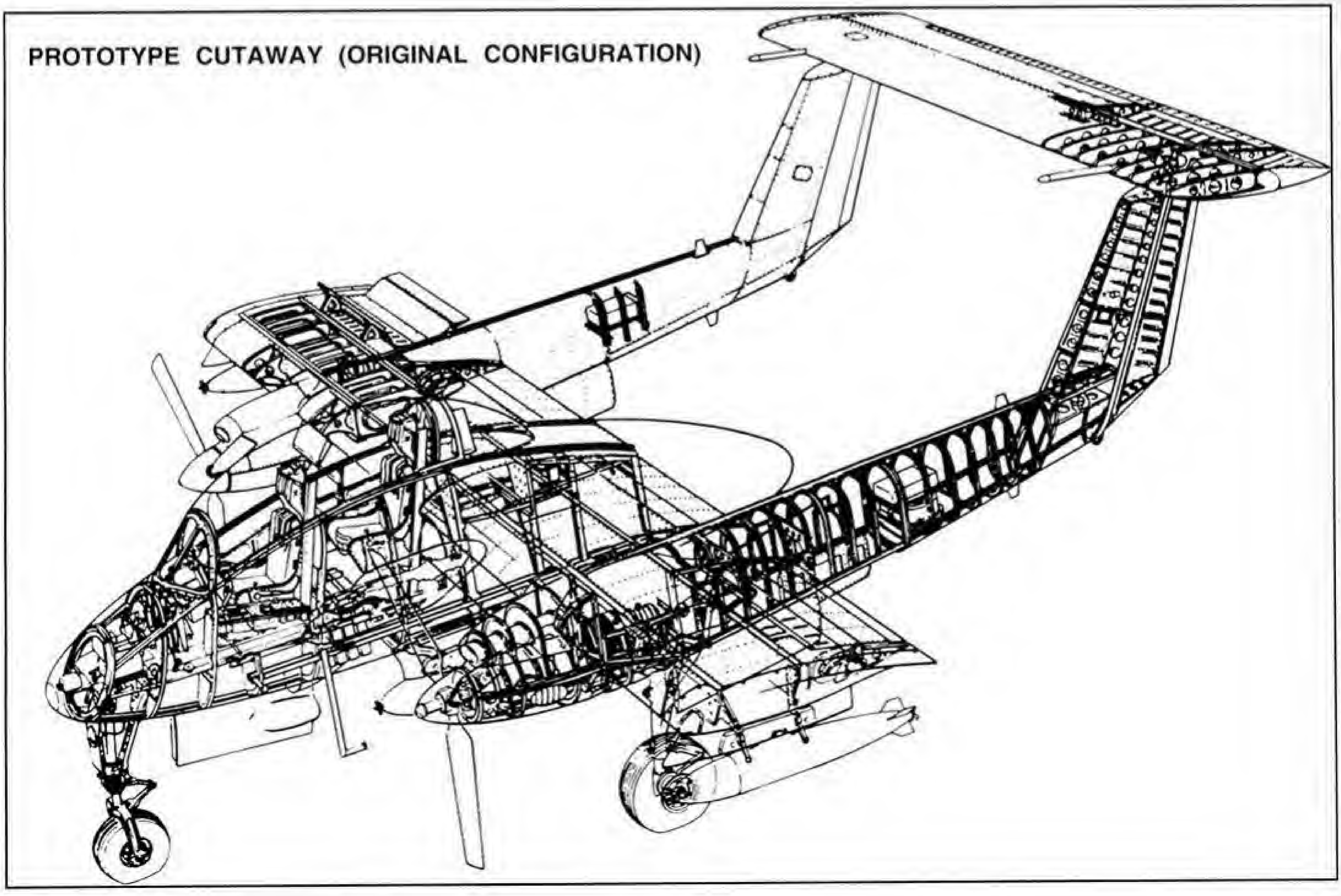
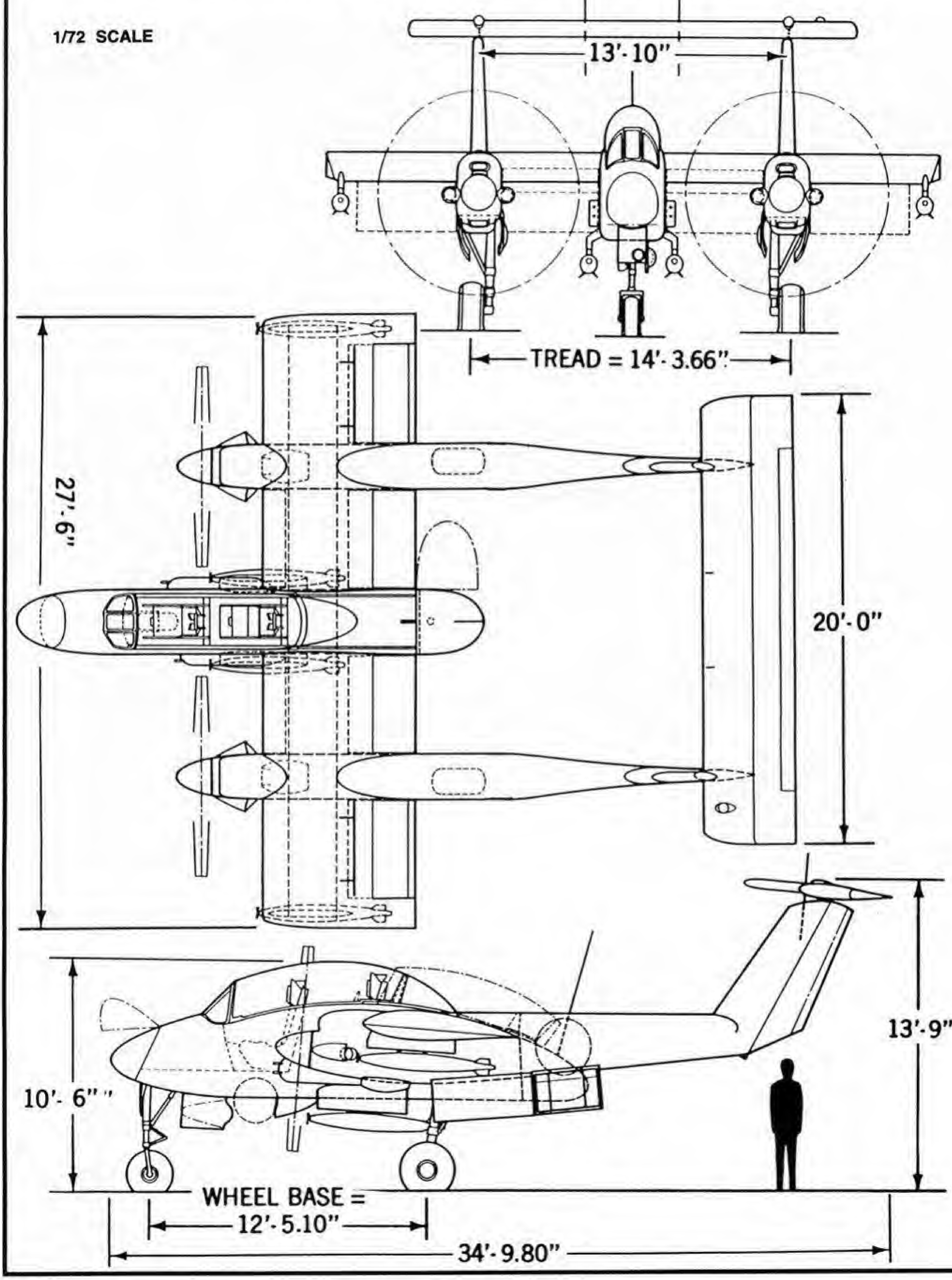
PROTOTYPE CUTAWAY (ORIGINAL CONFIGURATION)



ORIGIONAL CHARGER PROTOTYPE LAYOUT



light-light Marine attack aircraft. They wanted a 20-foot wingspan, so that it could operate from unimproved roads with trees or telephone poles along side the road. The landing gear had the stringent requirement to land on a rough road at 20fps rate-of-sink. It was equipped with twin booms, so that the center fuselage could be used for a variety of missions. They called for twin turbo-prop engines that could burn any kind of fuel. The plane must have extremely short takeoff and landing distances...500 feet over a 50 foot obstacle from unimproved fields. Simple electronics with one radio, a pilot and observer.......much debate about controls in the second seat. Low cost, rugged, easy to maintain with minimum support equipment. So simple they even thought the machine guns should be manually charged. They also envisioned an amphibious version where the floats retracted into the booms. Needless to say, their requirements were close to impossible, but neither K. P. or Bill ever relaxed their requirements.

Above and below, two views of the mock-up, which changed very little in the prototype form. Convair spent a great deal of effort courting the Marines for support of the project. Therefore, it wasn't surprising to see MARINES painted on the mock-up. (via Jim Fink & Johny Knebel)

At Convair, Charles Frick, V.P. of Engineering, at his staff meeting, announced that I was to be the Program Manager for the preliminary

design and development of the COIN (counterinsurgency) or LARA (Light Armed Reconnaissance Aircraft). I had been assistant to Art Lambert, Chief of Preliminary Design, and we had already done some preliminary layouts of a COIN configuration.

From there on it was working with K.P., Bill, and a wide range of joint service representatives: Marine, Army, Navy, and Air Force, as well as DDR&E and ARPA. The most gratifying part of the program was working with these people. Tug Richardson (the Charger marketing man) and I could start at 0700, go through four appointments, have lunch with one or more of the customers, and continue with four appointments in the afternoon. Back to the hotel, then a dinner and evening with one or more customers (and wives). It was especially nice to be invited to their homes for the evening. This went on for months. Tug and I lived in D.C. except when we came back every weekend for Charger meetings at Convair to make changes and update data. Dick Lingley, my assistant, and I spent hours on the telephone from D.C. to Convair getting questions answered, and preparing data for the next week's presentations.

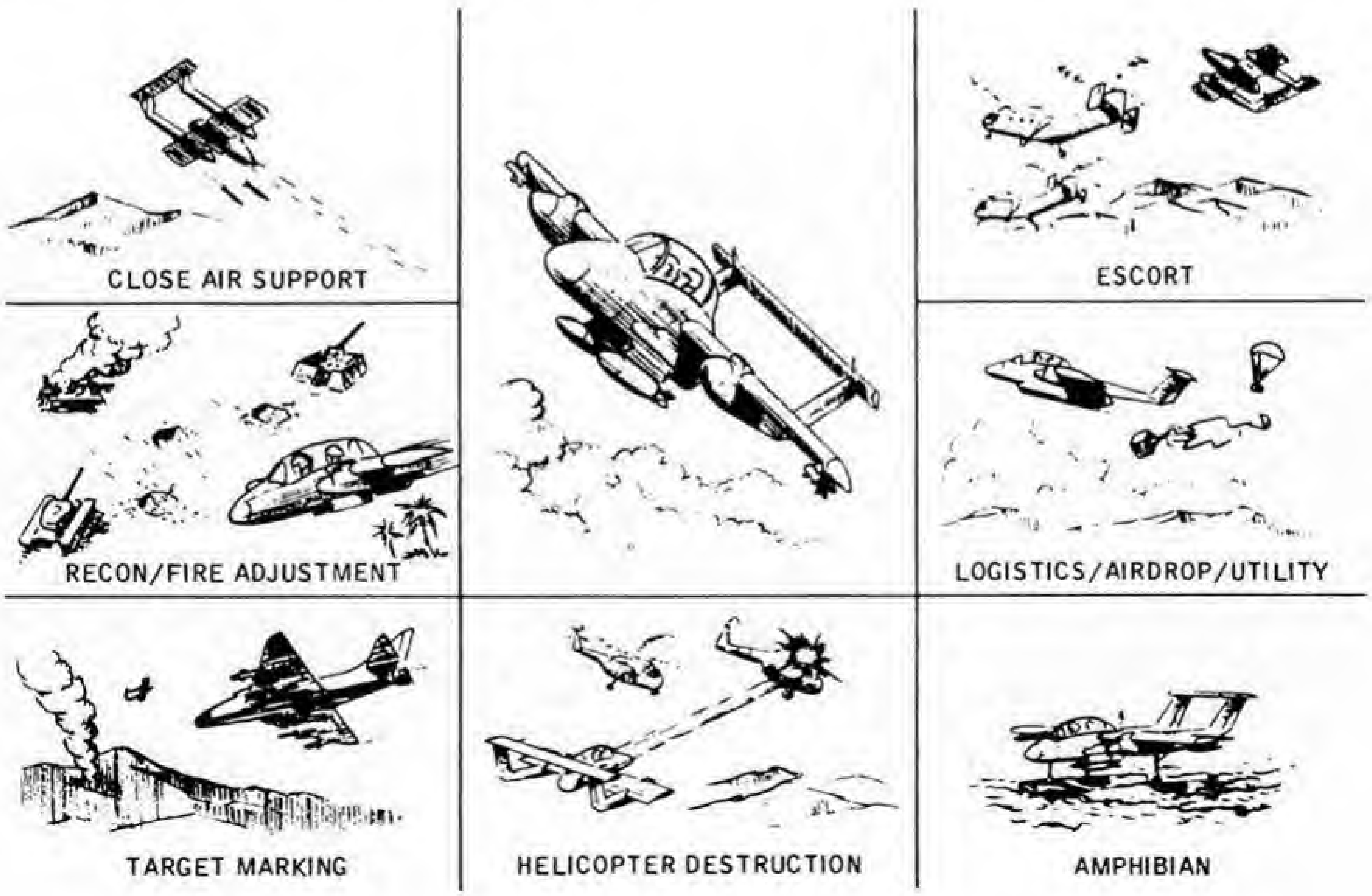
"Counterinsurgency" was a big thing in the early sixties. A Counterinsurgency Committee was established in the Pentagon, headed by LTGEN Victor Krulak, USMC. this Committee had their own idea of a COIN airplane. Very conventional, single fuselage, high wing, tail-sitter that could be a medevac type with minimum firepower. Needless to say, we had to do preliminary design studies of that configuration.

The Chief of the Air Section at the USMC Development Center was COL Andre Gomez. He was in tune with K.P. Rice's & Bill Beckett's version, and we kept him well informed of our Charger. He and his boss, LTGEN Snediker, attended the Charger roll-out ceremony at Convair.

In 1963, Convair had no aircraft programs, and very little else, other than some Atlas-Centaur launch vehicle follow-on programs. So I told my boss, Joe Famme, Convair President and big Charger supporter, "Why don't we build a prototype?" After all, the preliminary design was well beyond that, and most design details had already been completed. I took the proposal with Tug, Famme and Frick to Roger Lewis, at General Dynamics, and presented my idea to Roger. It was a strange meeting, because Roger was rather negative, and soon Famme and Frick joined his side. Roger told Tug and me that we were too enthusiastic, then he stands up, turns to me, and says, "Build the Charger". Actually, we fabricated two prototypes, but only assembled one.

With the design being well along, we put engineering, tooling, and the experimental shop gang all together, as one team, secretly, in Convair Building 69 (affectionylly the Charger team called it VAT 69!). The team worked closely together, all in the same building. The drawing boards were 50 feet from the prototype being

PERCEIVED CHARGER MISSIONS



constucted. When the shop man needed a drawing, he'd pull it off the engineer's board, and the two would hand wave the details. The prototype was designed, tooled, and manufactured in six months with no one outside VAT 69 knowing what was going on. When the parts went through the main factory, a coded number was used. The team's motto, was "A date to remember we fly in September". We did not quite make it; the roll-out was in September and first flight was in November.

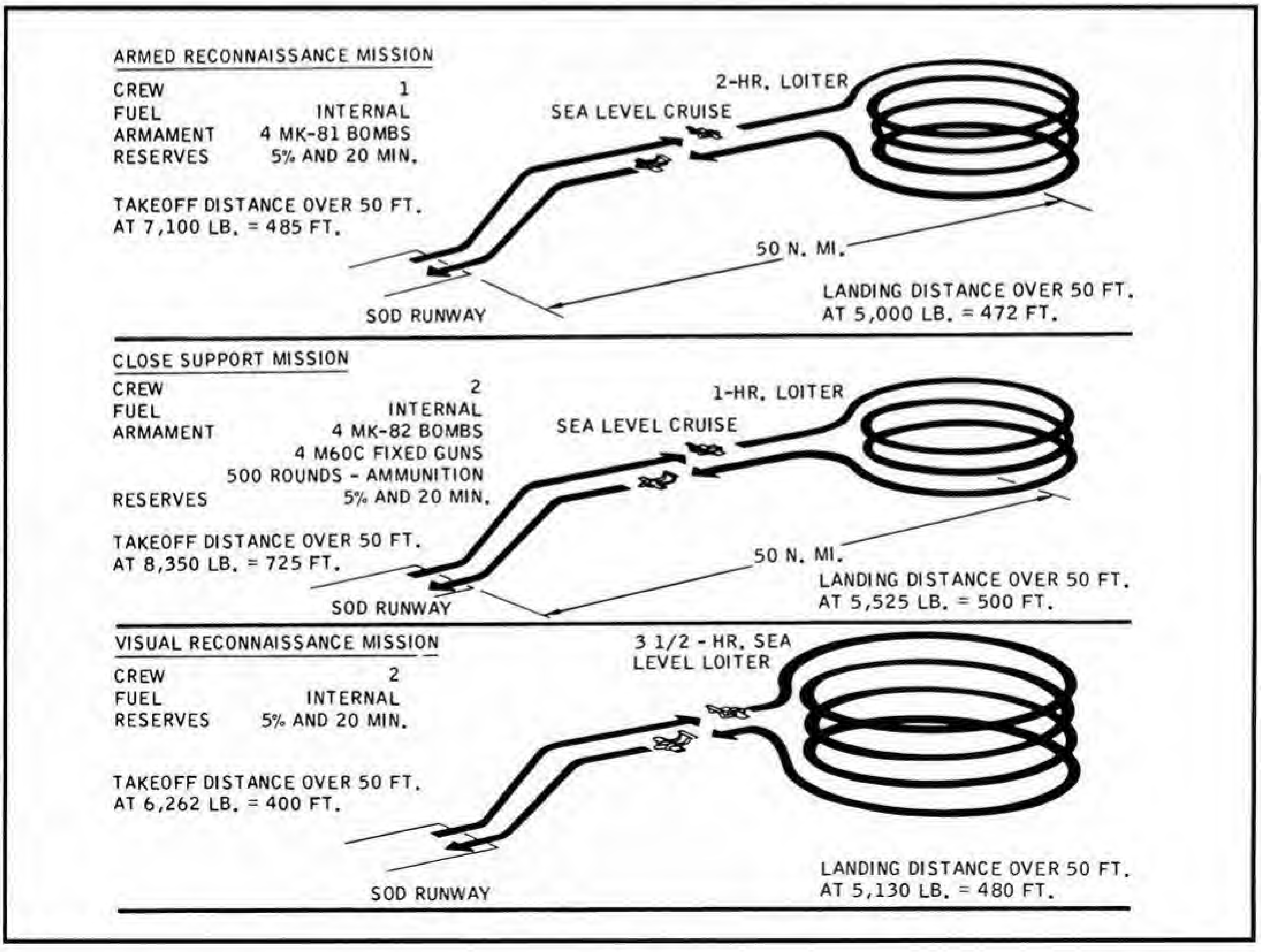
Johnny Knebe,l who first flew the aircraft, was the Assistant Program Manager in the early stages, and always wanted to be "Chief Test Pilot". Well he was the ONLY test pilot Convair had at the time , so I made him "Chief Test Pilot"!

While the prototype was being built, the proposal date of response approached. Our question was, should we tell BuWeps we had a prototype nearing completion? It was definitely to our advantage, and I leaked it to working Committee members. Famme was on the fence and Bill Fox said no. Fox had come back to Convair after a few years absence. One night in D.C., I convinced Famme we should tell the world. Fox was on his way to D.C. from California, and by the time he got there the world knew.

The Charger first flew without counter-rotating propellers, as a gear box was not available. With the arrival of the gear box, it was installed and the flight test continued. Aerodynamic analysis and wind tunnel tests dictated that the counter-rotation of the propellers to be inboard blade up (like the P-38), and that is how the engine/gear boxes were installed. While I was in D.C., Fox decided to try it the other way and the airplane was layed up while the engines and gear boxes were switched. During the limited flight test program that followed, it was found that the airplane didn't fly worth a damn! So, back to square one. The airplane was layed up again and the engines/gear boxes switched back to the original positions.

Eventually NASA/Ames then flew a 10 hour STOL test program that was followed by a Joint Service Flight Test Program. A pilot from the Marines, Navy, Army, and Air Force took turns flying the Charger.

LCDR Dave Hardin was the Navy pilot. Hardin had been placed in an administrative job after having wiped out a couple of aircraft at Patuxent River. He somehow managed to get his name in as the Navy pilot and became the last person to fly the Charger when he ejected from it. The



Navy investigation team cited Hardin with eleven counts of pilot error leading to the crash. During the ejection, he smashed his foot when it got caught under the instrument panel. Because of this he would not fly for the Navy again. Ironically he went to work for North American Aviation in Columbus, builder of the OV-10 Bronco.

Hardin's first error was the unauthorized shutting down of the port engine after his scheduled flight testing had been completed. That was a NO-NO. At that time, the engine drove an oil pump that lubricated the gear box. Naturally, the gear box seized. Hardin restarted the engine, but in his state of mind failed to contact Convair flight test. The gear box probably would have performed with oil. He then decided to bring it in single engine. But instead of setting up his landing configuration way out, he dropped the gear and flaps right at the end of the runway. He lost control of the aircraft. Witnesses say he was so close to the ground, if he had shut off the other engine, he would have landed. He made the serious mistake of deciding to go-around ... that was a definite NO-NO rule! Pouring the power to the starboard engine with STOL high-lift flaps down caused him to roll to the left and head to the left. The cockpit of the Charger was designed to be small, using the A-4 cockpit as an example. Because of this, a pilot was not supposed to have his clipboard on his thigh during takeoffs and landings. Hardin had his on his right thigh, and therefore had about two-thirds stick travel. With his stick hard over to the right and with full right rudder, he was headed for the tower at Lindbergh Field. He punched out at about 30 feet of altitude, and his chute opened as he landed on a three story building at Ryan. He did prove the zero-zero ejection seat worked! The Charger continued its roll and landed up-side-down next to the fence at Ryan.

After the crash there was not any consideration for assembling the second prototype. By this time, with Convair out of the aircraft business, other than as a subcontractor, and with business dwindling at Astronautics, it did not make much sense. No doubt, this was the last time a major manufacturer will ever build a prototype with corporate dollars!

OVERVIEW OF COMPETITOR'S COIN DESIGNS

Requests for COIN proposals were issued to 22 manufacturers in October 1963. Responses were received from nine companies: Beech, Douglas, Convair, Goodyear, Helio, Hiller, Lockheed, Martin and North American.

The Beach design was designated PD-183 and was to be equipped with the same two engines as the Charger, Canadian T74/PT-6A Turbo-props. The fairly conventional layout is shown at right.

The Douglas design designated D-855 was a single fuselage design characterized by a T-shaped tail unit, and a rear loading door. It was drafted to utilize either United Aircraft of Canada T74/PT6-As or Garret AiResearch T76 turboprops. An illustration of the design proposal is seen at right.

The most interesting, yet somewhat similar design to the Convair Charger and North American OV-10 Bronco was the Martin entrant. It was designed around two T74/PT6-As in twin booms, but instead of a T-tail as used by Convair and North American, the Martin design utilized an inverted V empennage with boundary layer controls. The hot jet exhausts are

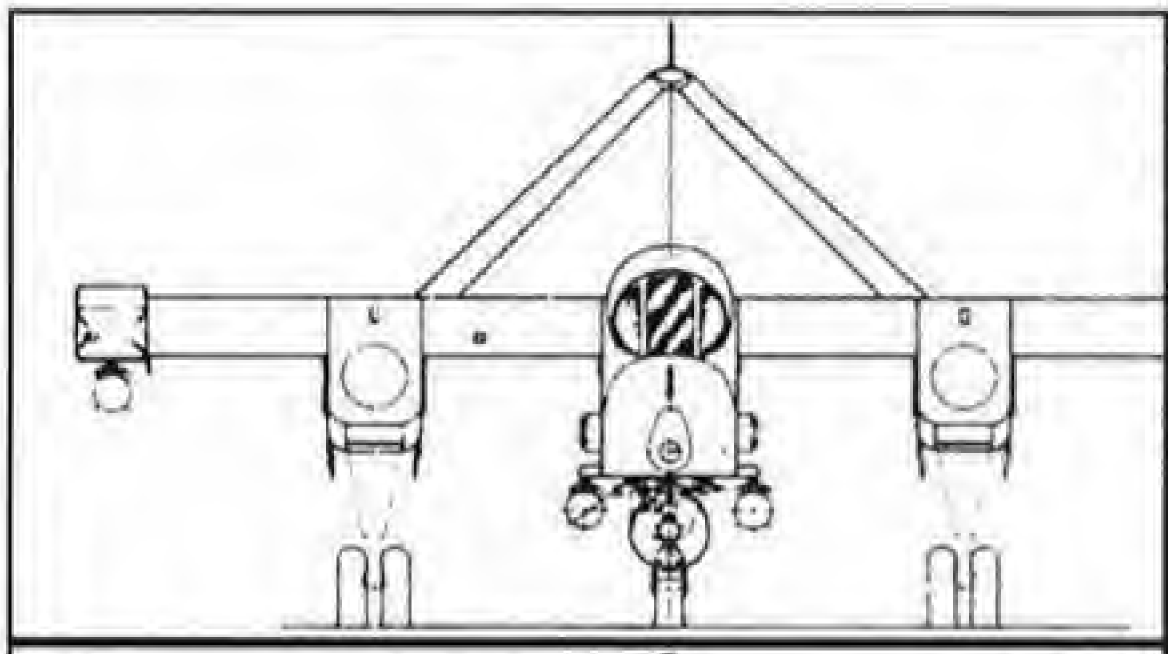
Above, Beech PD-183 proposal. Below, Douglas D-855 proposal. (via W. Morris)

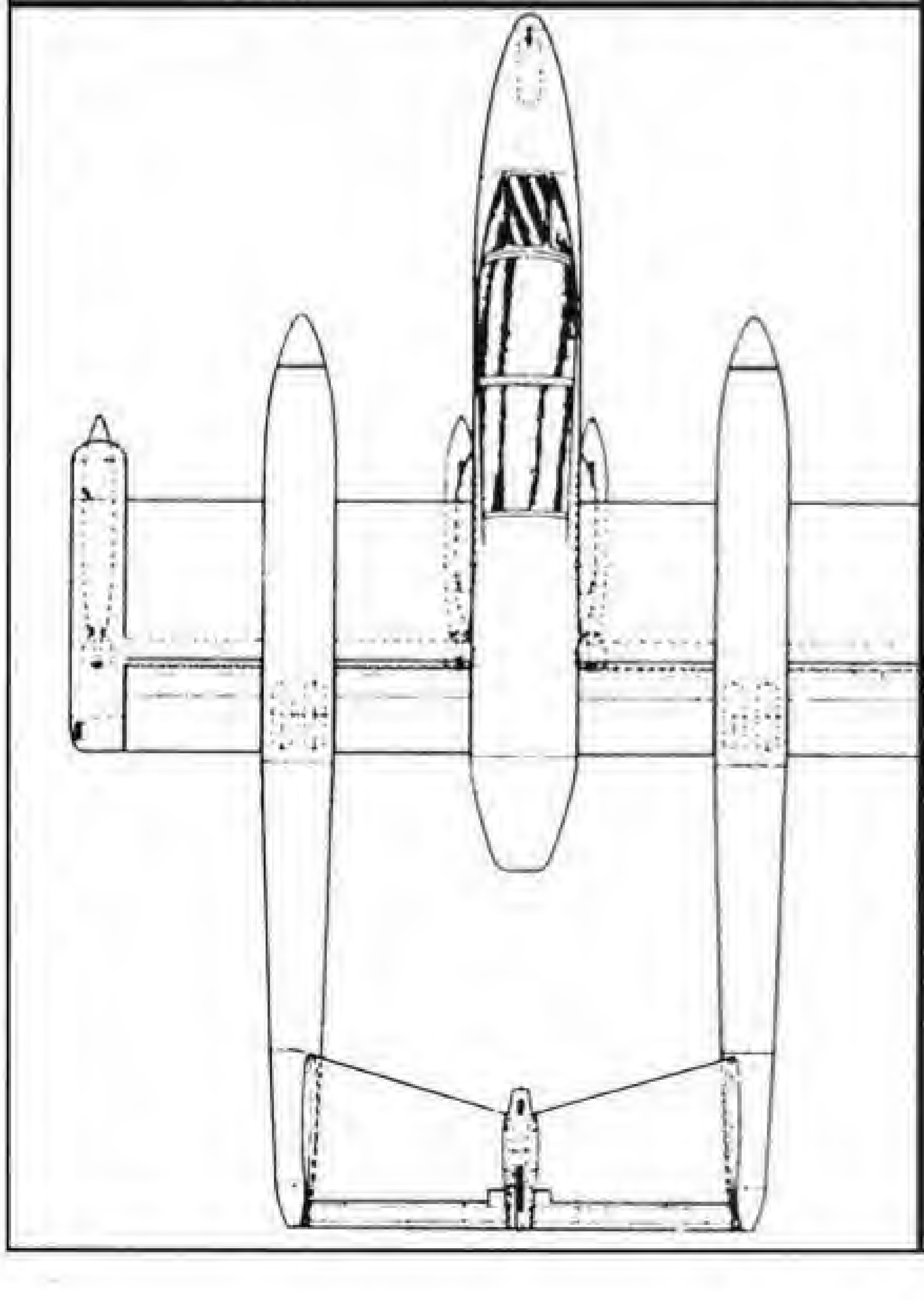
passed through stainless steel ducts along the tail booms to the tail, where they are then ejected across the lower ruddevator surface through 16 small nozzles. The blown ruddevator surface setting is adjustable through a wide angle and the negative lift thus obtained allowed pitching moments caused by the slipstream on the wing to be cancelled out. Hydraulically operated spoilers on the upper wing surface would control roll during takeoff and landing when the flaps were down. The flap design called for a double-slotted arrangement with a deflection up to 55°

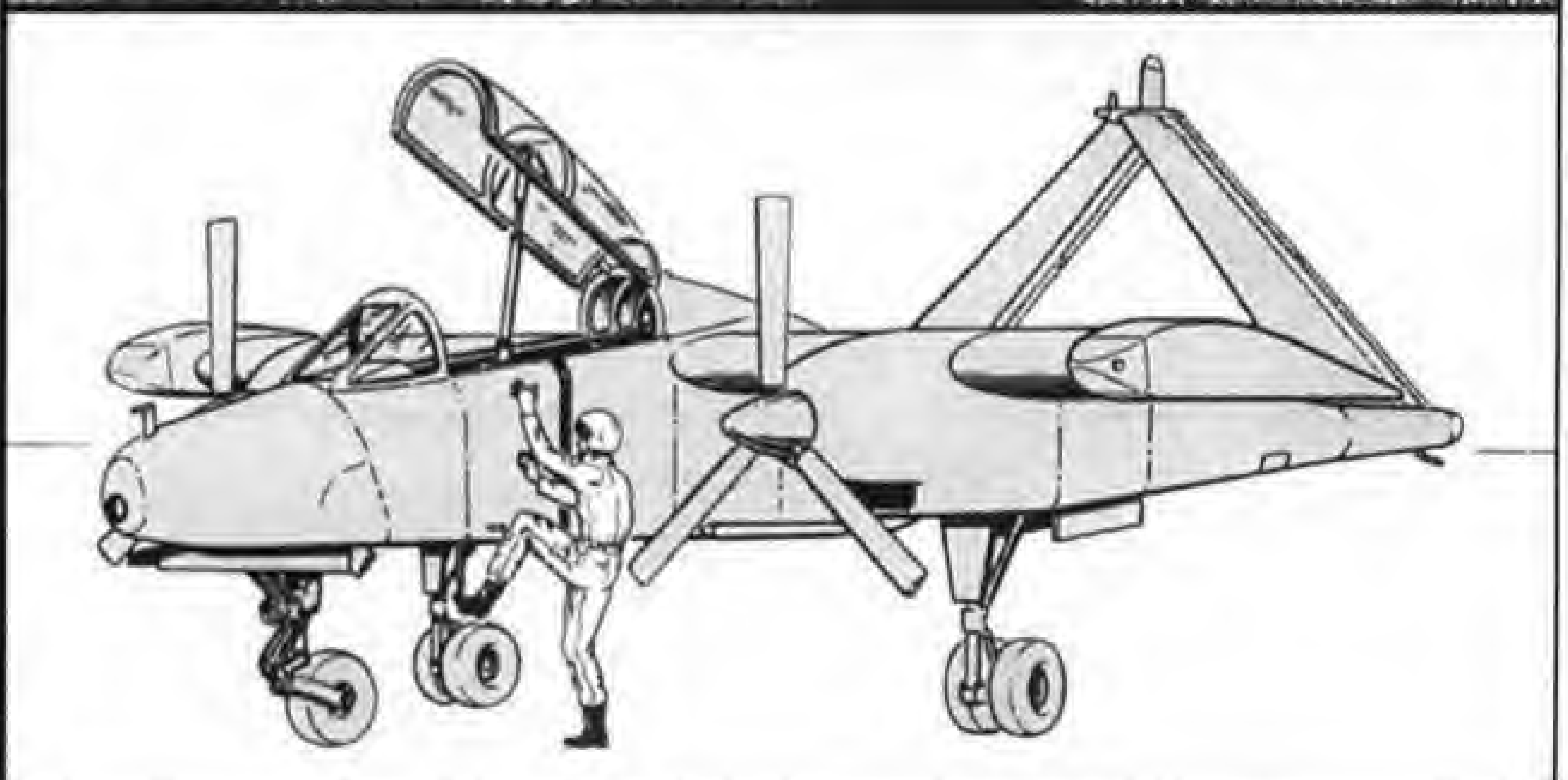
MARTIN COIN PROPOSAL DIMENSIONS

Length	**36.33 ft**
Span	**27.5 ft**
Height (including empennage)	**13.33 ft**
Wheel base	**12.25 ft**
Track	**13.67 ft**
Ground clearance at max weight	**3.62 ft**
Total wing area	**206.25 sq ft**
Total flap area	**55.56 sq ft**
Empennage area	**82.86 sq ft**

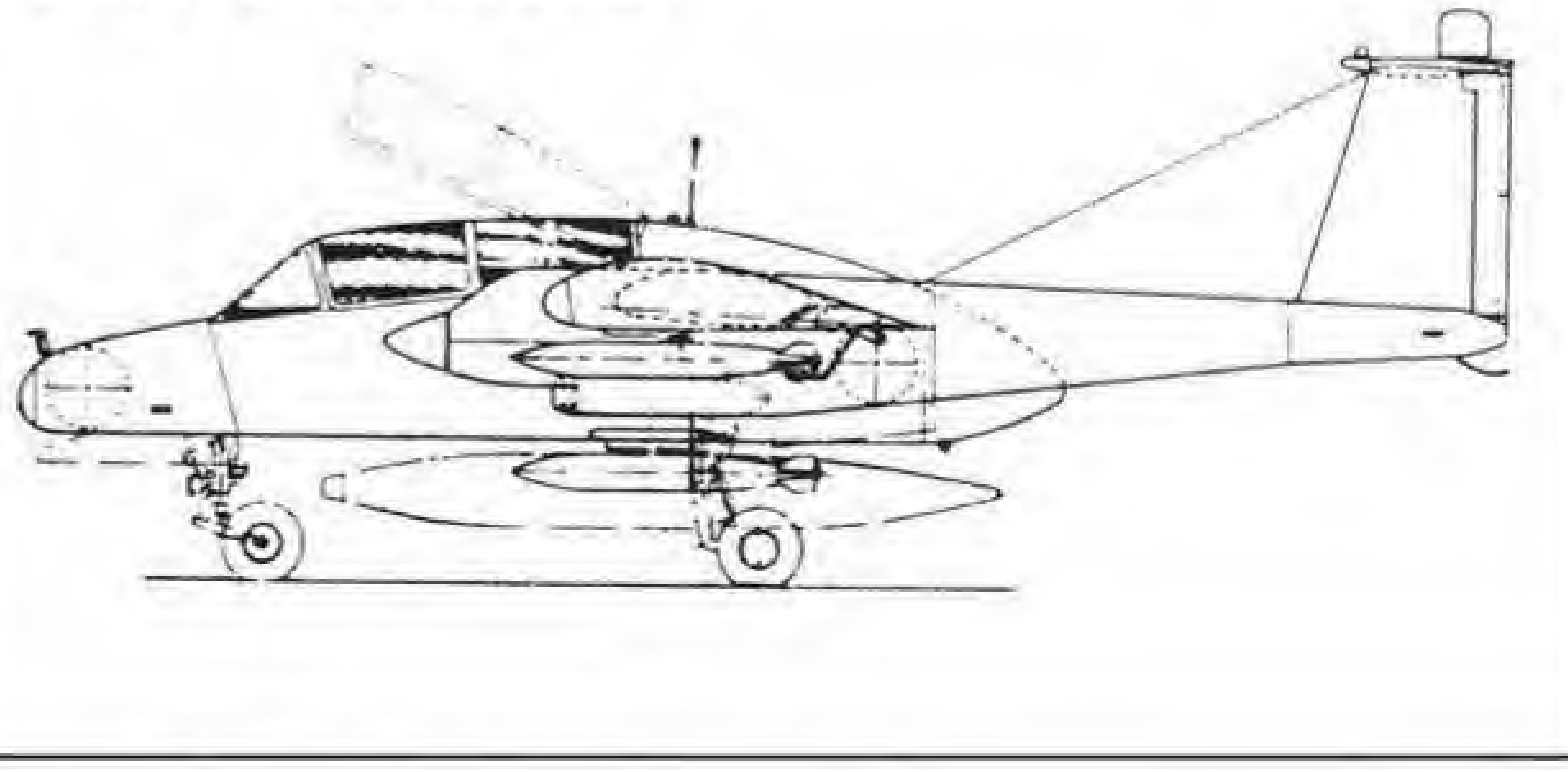
(Photos via Stan Piet/Martin museum)







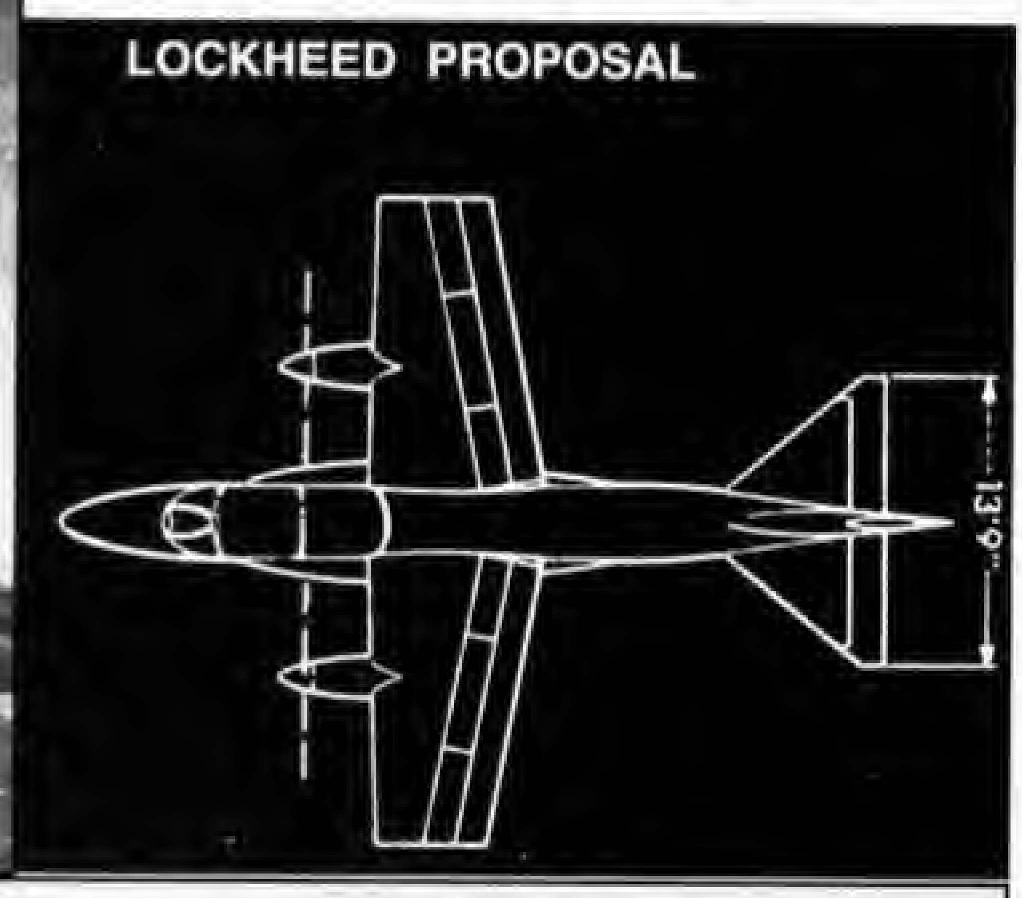
MARTIN COIN PROPOSAL



The Goodyear Aerospace Corporation's design was designated GA-39. The extremely unusual aircraft was to be made largely of plastic and was powered by two pylon mounted pusher turboprops for improved ground clearance. The Goodyear proposal is illustrated at left. The aircraft was to have a twenty-three foot wing span and a length of twenty-eight feet. Estimated top speed was 275 knots at sea level.

At left middle is an illustration of the Hiller proposal, which was strikingly similar in concept to the Convair and North American proposals.

The Lockheed proposal was designated the CL-760 and was to be powered by two AiResearch T76 turboprops. The aircraft was to have a 30 foot wing span and a 40 foot 3.5 inch length. Below is a photograph of the Lockheed mock-up and an illustration.



NORTH AMERICAN AVIATION OV-10 BRONCO

North American Aviation was awarded the contract for the Tri-Service (Navy - Army - Air Force) LARA or COIN aircraft by Defense Secretary Robert McNamara's political contract machine. After its initial teething and engine problems, the Bronco went on to become an excellent COIN or FAC aircraft. Unfortunately, these engine problems and the OV-10's much later first flight date than the Charger caused the aircraft to enter service almost two years latter than the Charger could have.

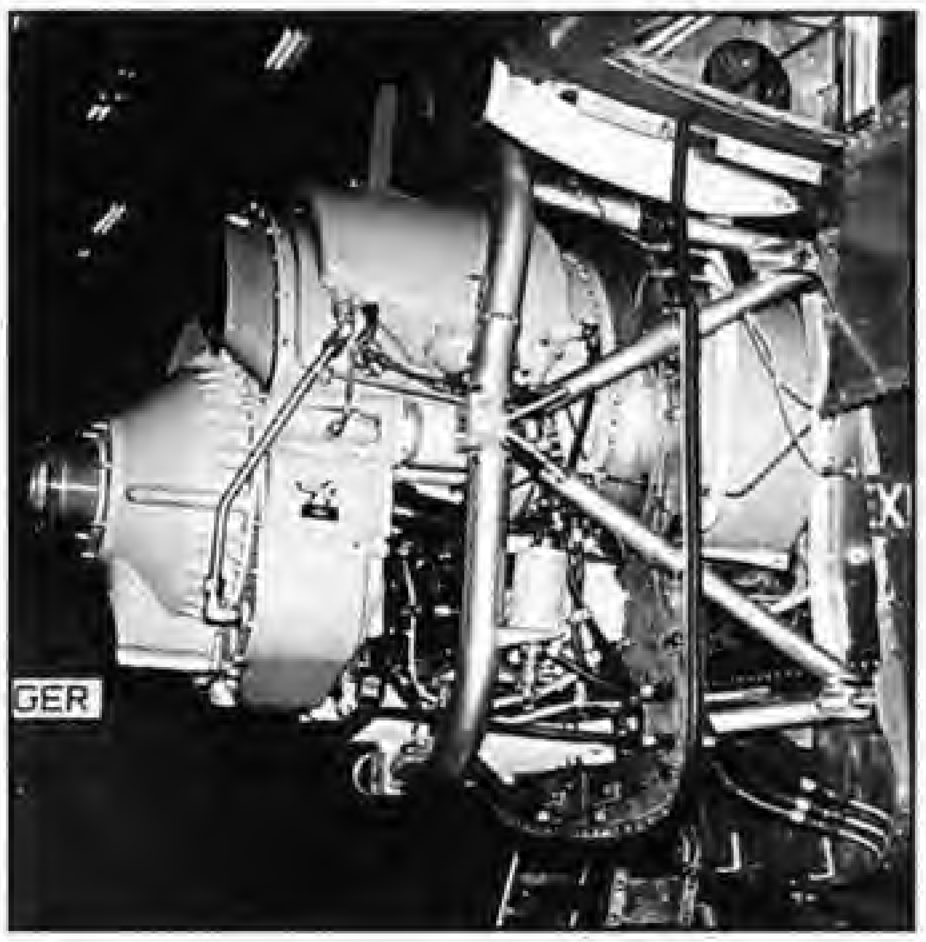
The Aircraft, although similar in layout to Convair's Charger, was built around the much larger (physically) AiResearch engines. Originally, these developed 600shp, but were rated at 715shp in the 113 production OV-10As. In 1987-89 some 59 Broncos were remanufactured into OV-10D aircraft with 1,040shp AiResearch engines.

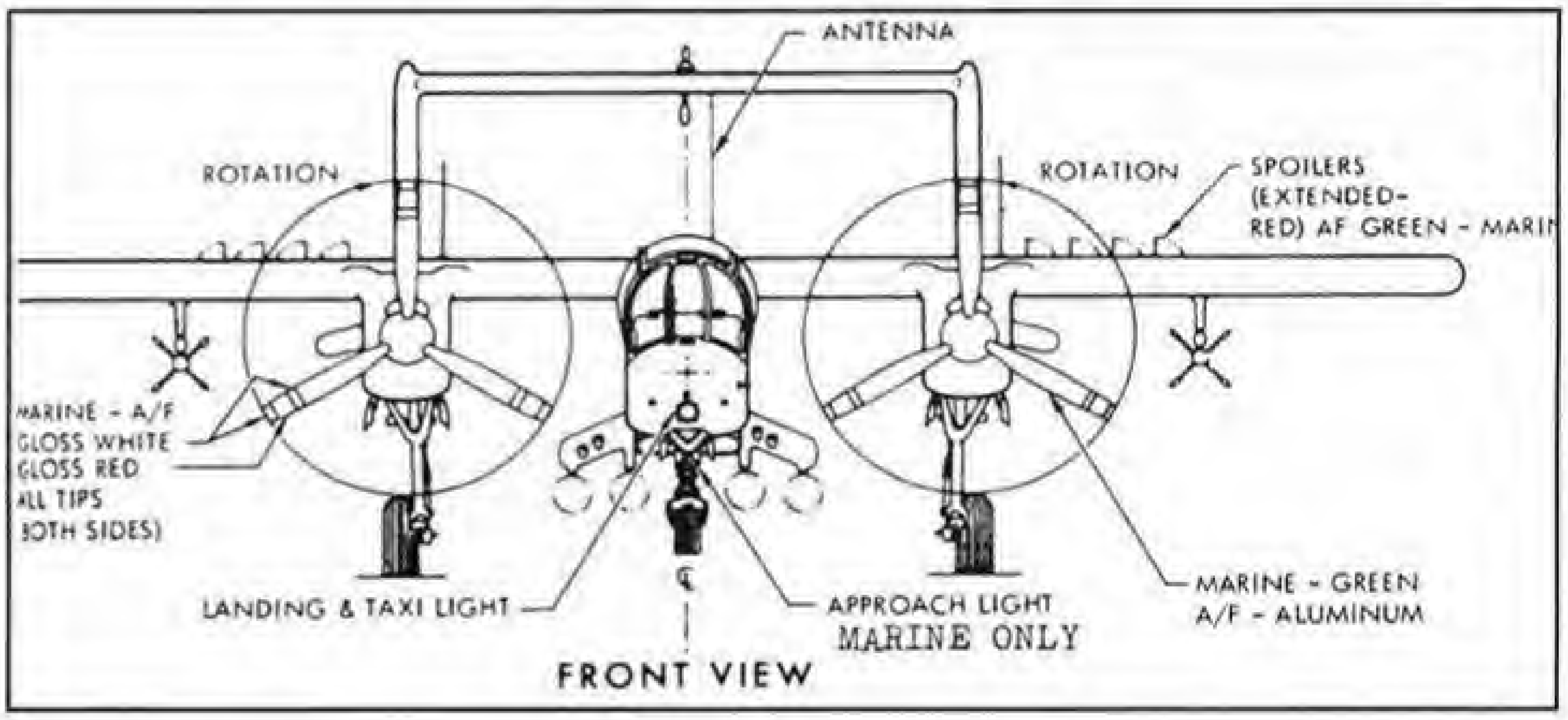
Photos: top, OV-10 floatplane mock-up. The ability to install floats was part of the design requirements, although they were never used on either the Bronco or the Charger. (via Stan Piet)

At right, the OV-10 Bronco mock-up painted in Marine markings as the Marines were the initiator of the program. (via Stan Piet)

Bottom right, one of seven prototype YOV-10A Broncos undergoing testing in Tri-Service markings. (USMC)

Below, AiResearch engine installation in the Bronco with cowling and propeller removed. (via Stan Piet)





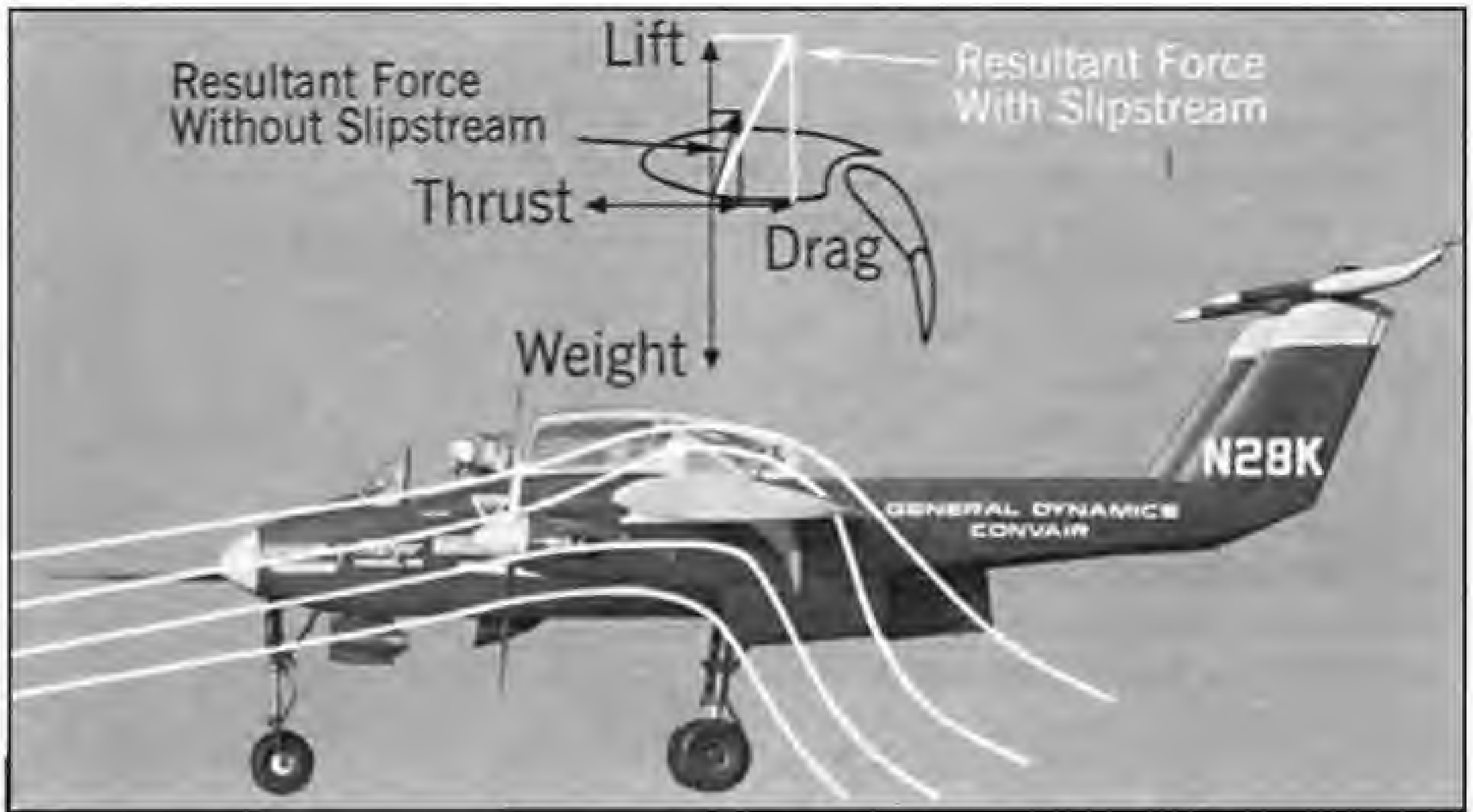
DEFLECTED SLIPSTREAM PRINCIPLE

The Navy RFP called for a takeoff and landing capability of 800 feet or less over a 50 foot obstacle. However, Convair's prototype boasted a 500 foot or less takeoff and landing capability. This feature, coupled with the ability to operate from fields and un-improved dirt airstrips, would give the Marines the quick-reaction close-support weapon they required. The capability of being deployed with front line units dramatically decreased the turn-around time between flights and the alert response time.

To achieve the performance necessary to operate from dispersed, rough, unimproved areas, Convair developed the deflected-slipstream thrust vectoring system. This system, coupled with the effective lightweight T-76/T-74 opposite-rotating turboprop engines, gave the, Model 48 the STOL capability to take off with a ground roll of only 225 feet.

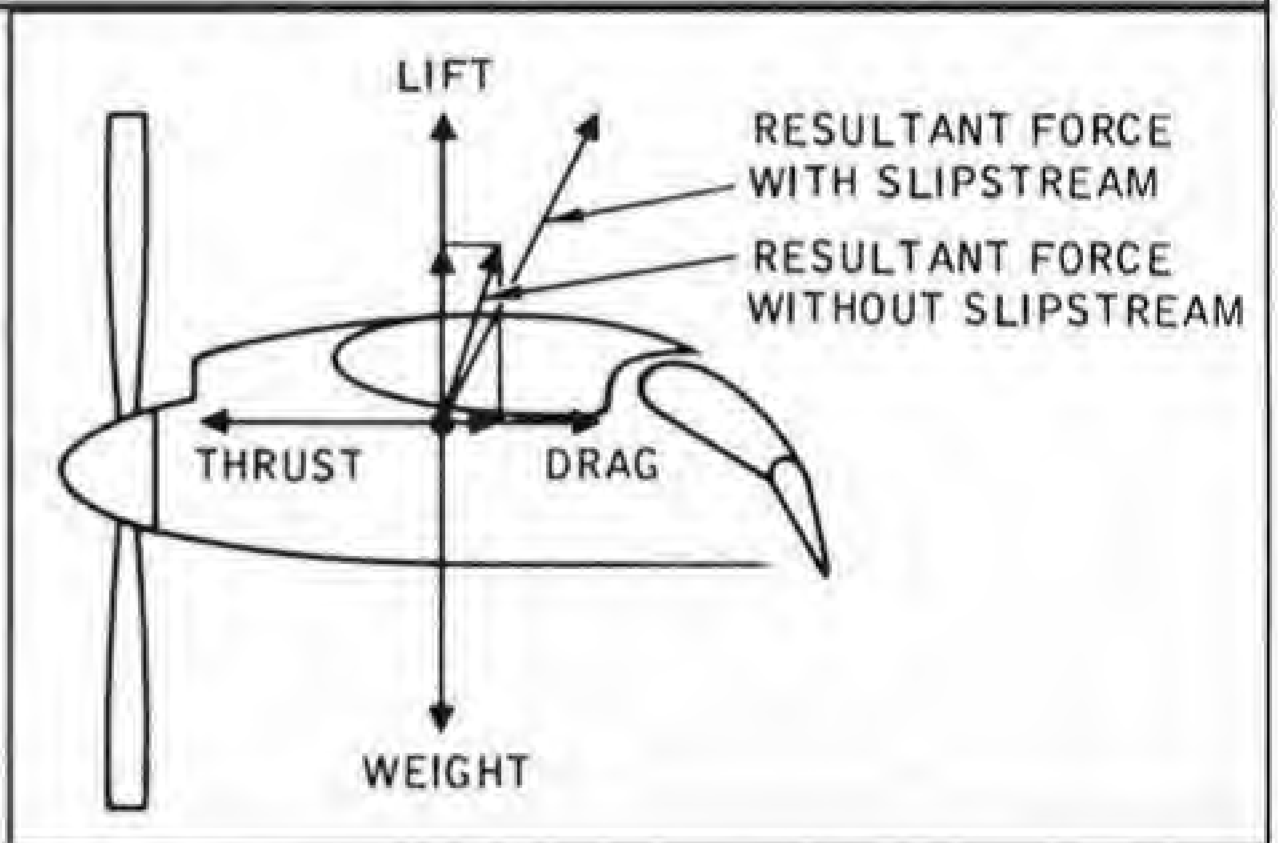
NASA research during the ten years previous to the construction of the Charger had demonstrated that the lift of airfoils in the slipstream of a propeller may be augmented by vectoring the thrust through the action of the wing and flaps. This augmented lift was best realized when the wing was completely immersed in the slipstream. Add to this the large trailing edge flaps which provided the camber that imparted a downward momentum to the slipstream --- ergo the "deflected slipstream principle".

Due to the Navy specifications, the original wings were only 27' 6" long to allow the Charger access to narrow tree-lined landing strips. These short wings were thought sufficient when aided by the slipstream of the opposite rotating propellers flowing over the thrust vectoring system. Initial testing showed that additional wing length was needed to gain adequate control response. The wings were thus lengthened to 30' 10.3" to correct the control problems. Due to this testing North American's OV-10 Bronco design was revised to the larger 30' 10" wingspan.



Above, a diagram of the slipstream flowing through the fully deflected trailing edge flaps. At right, deflected slipstream principle.

Below, diagram illustrating slipstream lift velocity. (via SDAM)



At left, with removal of the fuselage tail cone, the Charger was capable of ferrying a complete engine and propeller assembly to the forward area. (via Jim Fink)

CONVAIR PROMOTIONAL COIN

Another aspect of the design which was meant to keep the Charger operational in the forward areas, was the ability to airlift its own supplies. With the aft fuselage door removed (fuselage tail cone), the Model 48 could even carry a spare engine with the propeller installed. In addition to other logistic supplies, the standard fuselage was capable of carrying five 55 gallon drums or a 300 gallon forward area fuel tank. Convair further proposed a personnel pod kit which, when attached, almost doubled the cargo capacity of the basic airplane.

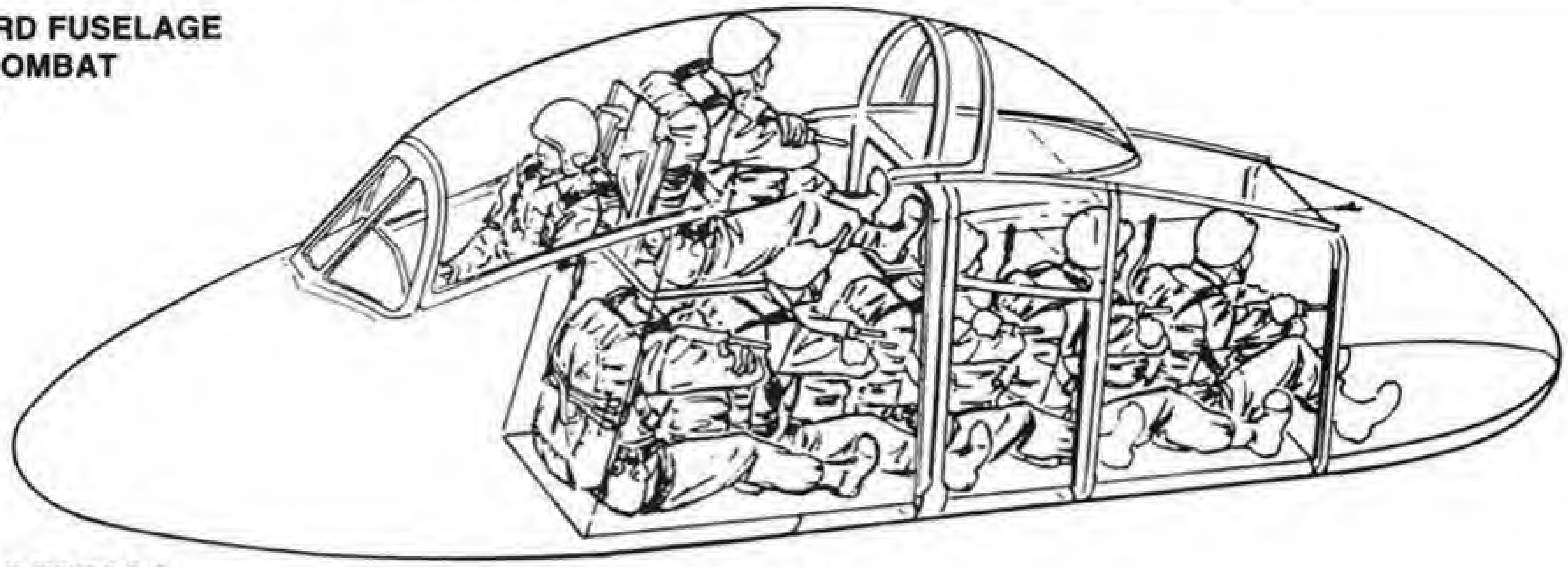
In the standard fuselage configuration, six combat troops could be carried if the second crewman was deleted. With the personnel pod added, eight combat troops could be carried. Additionally, 2 litter patients could be carried in the standard fuselage, or 3 litters could be carried with the personnel pod attached.

At left middle, the Charger mock-up showing the original size of the cargo compartment and the hinged tail-cone. (via Johnny Knebel)

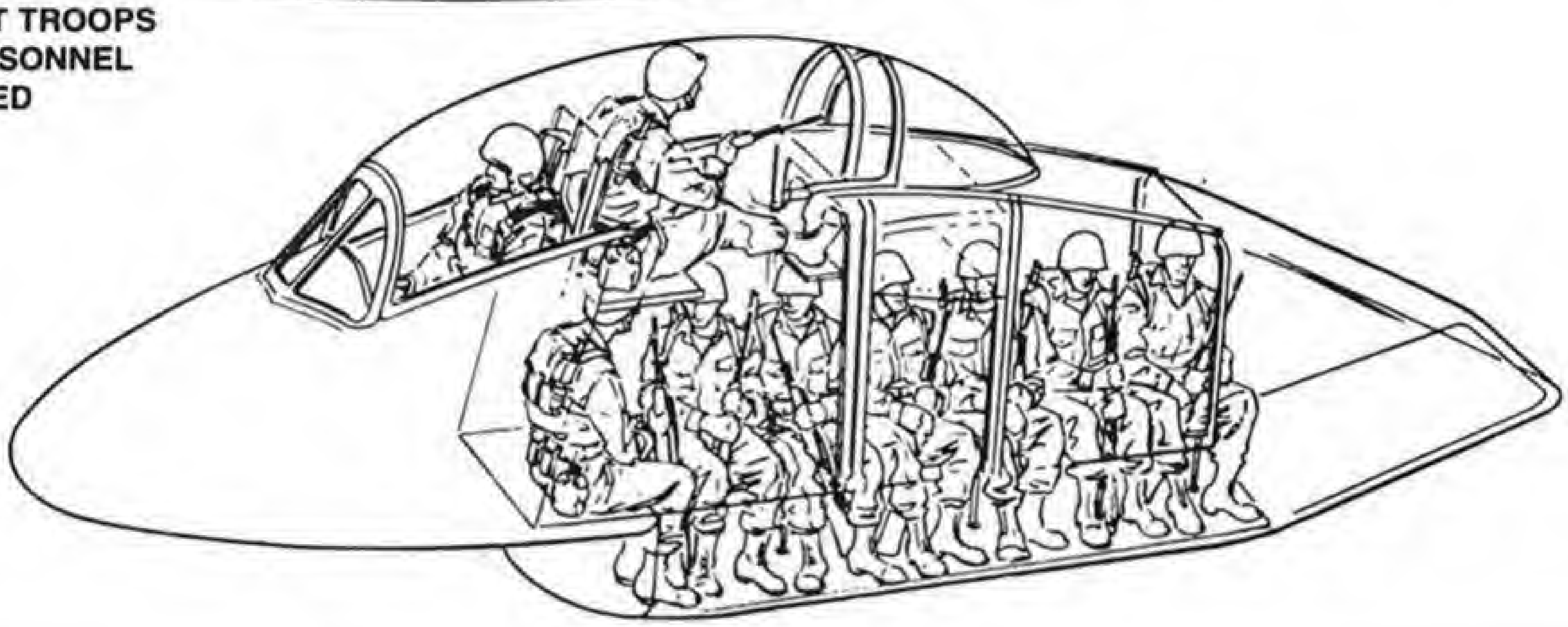
At left, five Marines loading a litter patient into the back of the Charger. (via Jim Fink)

LOGISTIC SUPPORT CAPABILITIES

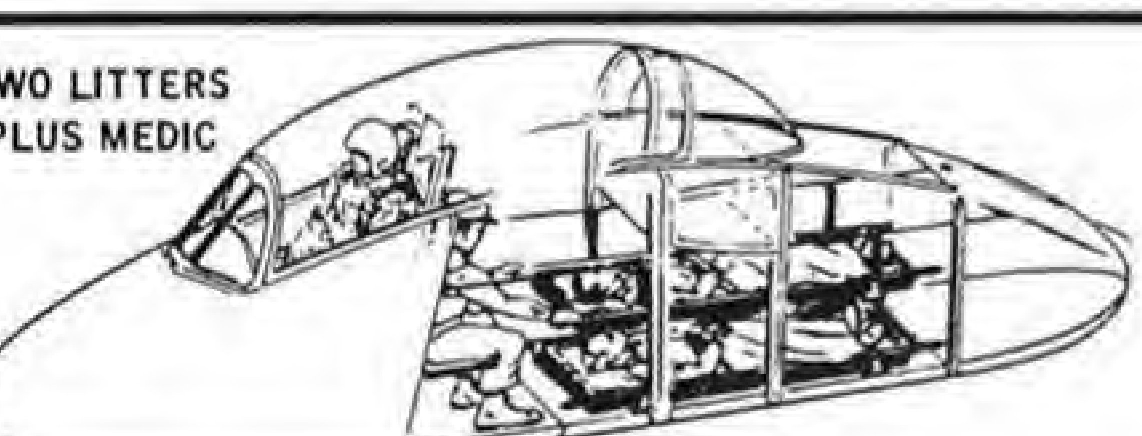
STANDARD FUSELAGE
WITH 6 COMBAT
TROOPS



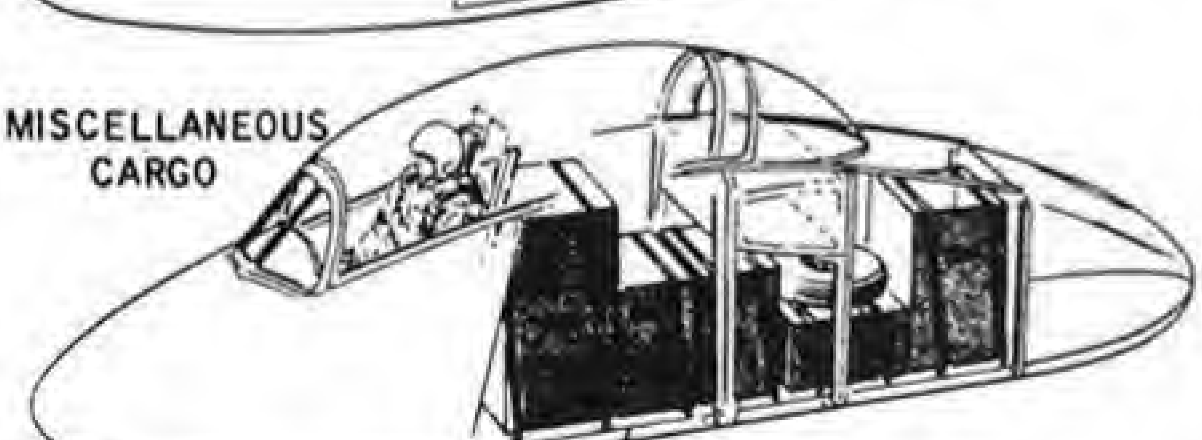
8 COMBAT TROOPS
WITH PERSONNEL
POD ADDED



TWO LITTERS
PLUS MEDIC



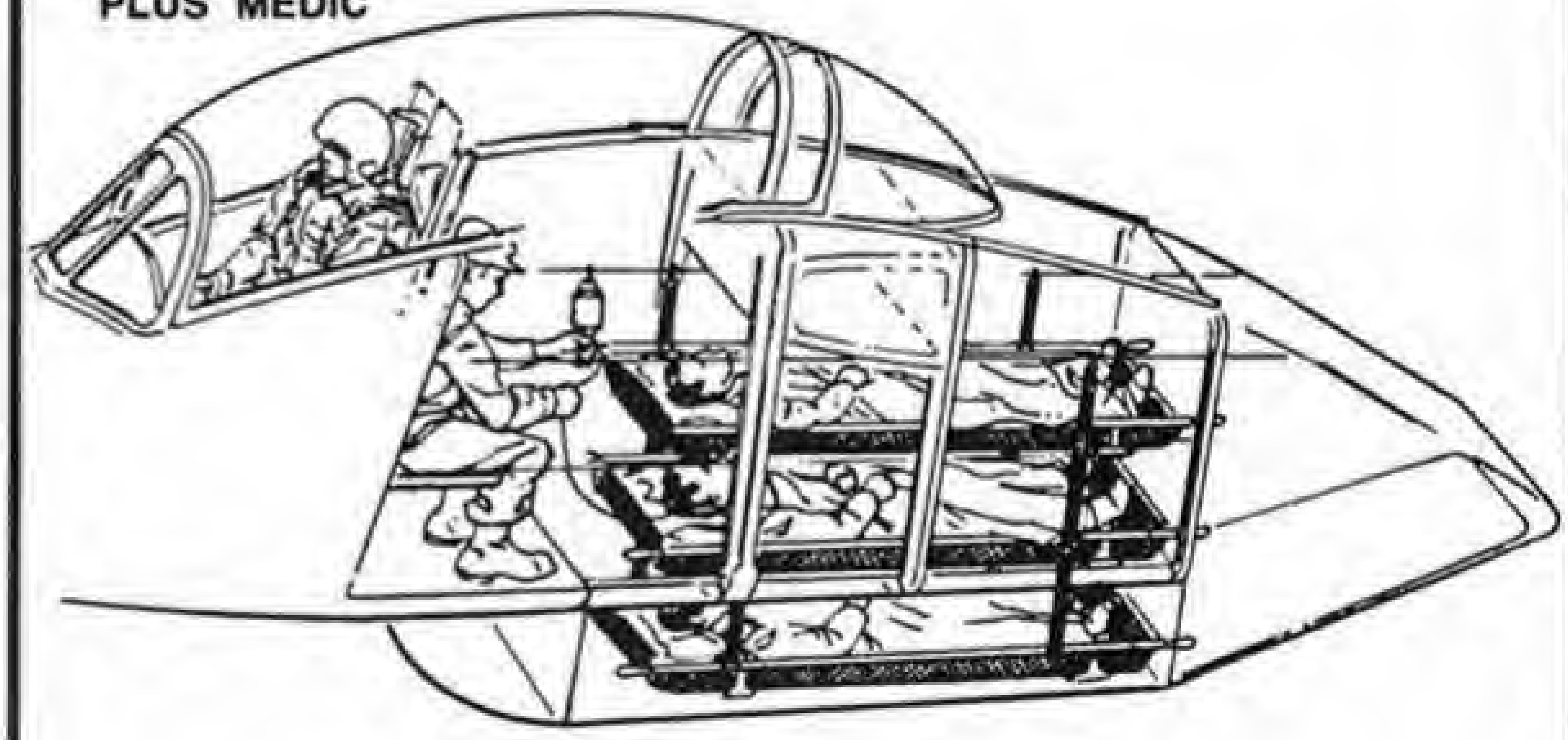
MISCELLANEOUS
CARGO



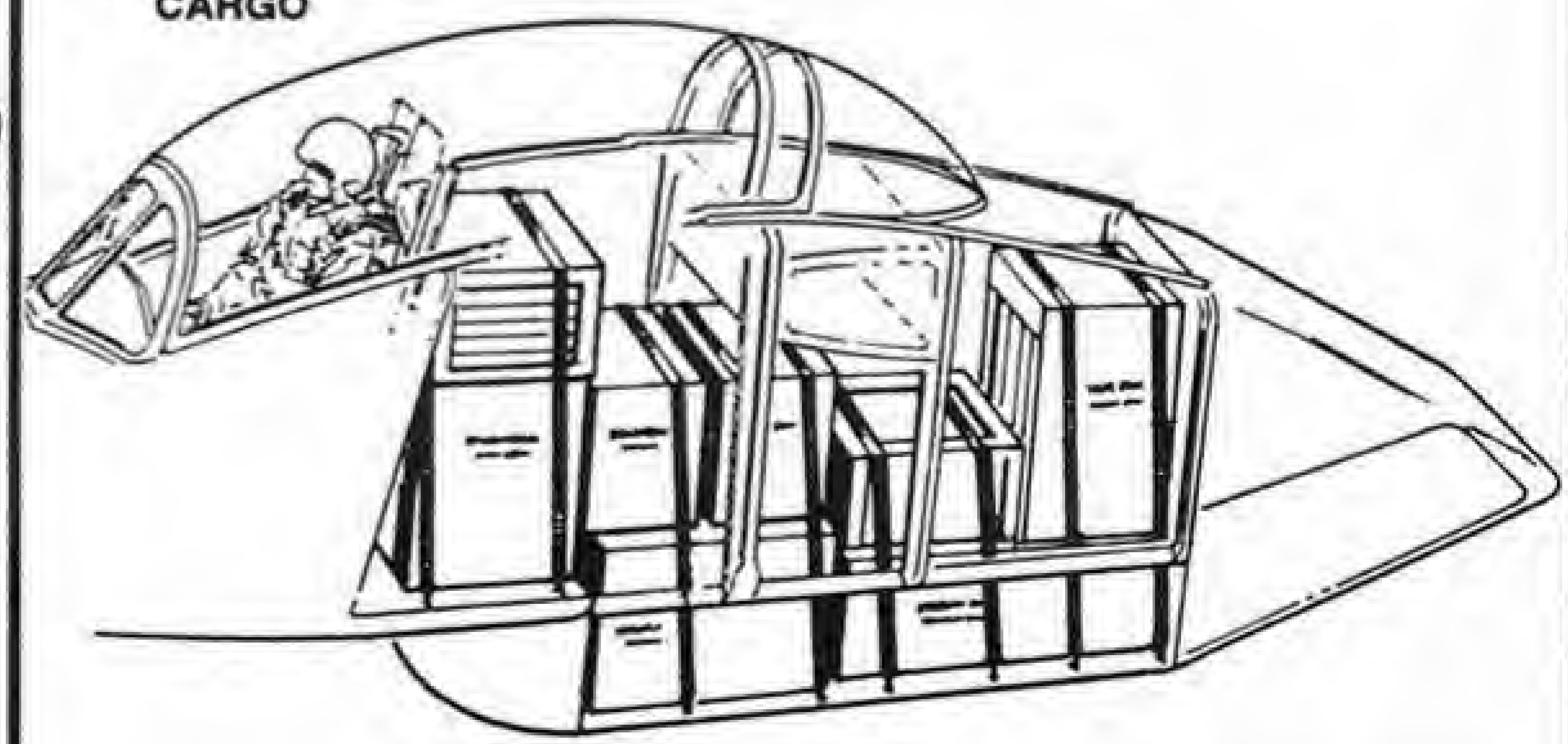
FIVE 55-GAL.
DRUMS

300-GAL.
FORWARD AREA FUEL TANK

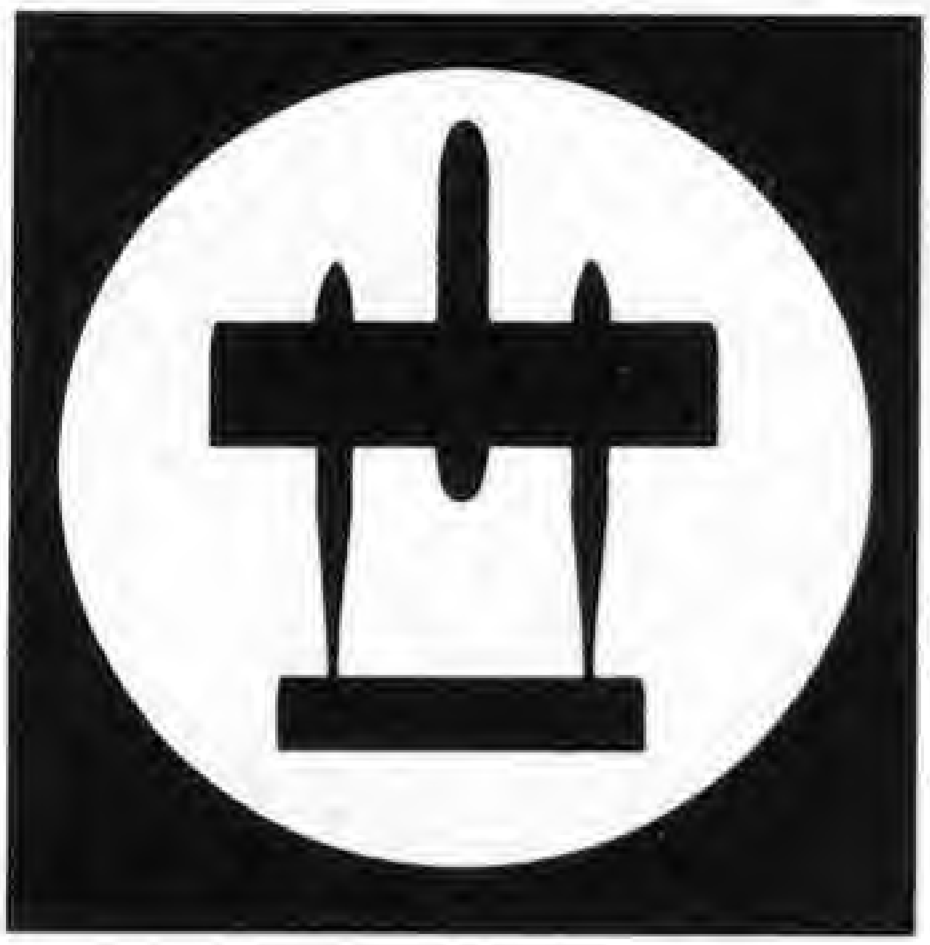
THREE LITTERS
PLUS MEDIC



MISCELLANEOUS
CARGO



Above, mock-up of extended personnel pod with six men inside. Two additional men would be carried in the fuselage, see pg. 12. (via SDAM) At right, Marines demonstrate ease of loading the Charger from the back of a pickup truck. (via Jim Fink) At right middle and bottom, Marines demonstrate refueling from a forward area tank truck. (via SDAM/Jim Fink) Below, three Marines demonstrate refueling an M-60 Tank from the 300 gallon forward area fuel tank that the Charger could ferry to the front. (via Jim Fink) Bottom, two Marines demonstrate refueling the Charger from 55 gallon drums off of the back of a field pickup truck. (via Jim Fink)



Above, a "Coin" Zapper. This design was also used on a 1.5 inch coin to capitalize on the "Coin" concept, and was given to everyone during hand shakes, see pg. 11. (via J. Knebel)

Above, the roll-out ceremony at Convair with Johnny Knebel in the cockpit and with James Fink at the microphone. With civil registration N28K the prototype was originally overall olive green. (via SDAM)

The Model 48 Charger will be discussed in three configurations: initial prototype, modified prototype or Charger I, and the production proposal or Charger II, which incorporated all design changes dictated by the flight test program and contract specification changes.

A three-view drawing of the Charger prototype, first flown on 25 November 1964, is presented on page 2. The primary change between the first flight configuration and the modified or Charger I configuration was increasing the wing span to 30 feet 10.3 inches and the revised wing tips. The wing tips were changed from their initial squared off tip to a 60° chamfered tip. These changes reduced induced drag and increased performance. In addition, small dorsal and ventral fins were added to the tail booms, which resulted in increased strength, directional stability and single-engine capability. This configuration is illustrated in the three-view on page 15. The Charger II proposal is illustrated on page 16.

GENERAL ARRANGEMENT

The Charger nose section housed the nose landing gear and electronic equipment. The center section contained two cockpits. The forward cockpit contained the flight controls, instruments and required electronics. The aft cockpit could be configured as required. The center structure was fitted with hard points to support external stores. The after section contained the cargo-utility bay area with a downward-opening door along the lower surface, and a sideward-opening tail cone.

WING GROUP

The wing consisted of a single assembly, integral with the fuselage. The wing was of full cantilever metal construction. It included flaps, spoilers, nacelles, and internal non-metallic fuel tanks.

The wing had an unswept constant chord surface which included two main spars for the attachment of leading edges, nacelles, tail booms, spoilers and flaps.The all-metal wing structure incorporated complete provisions for fuel feed tanks in the inboard sections and fuel transfer tanks in the outboard sections. The wing tips' structure incorporated provisions for attaching two demountable pylons.

TAIL GROUP

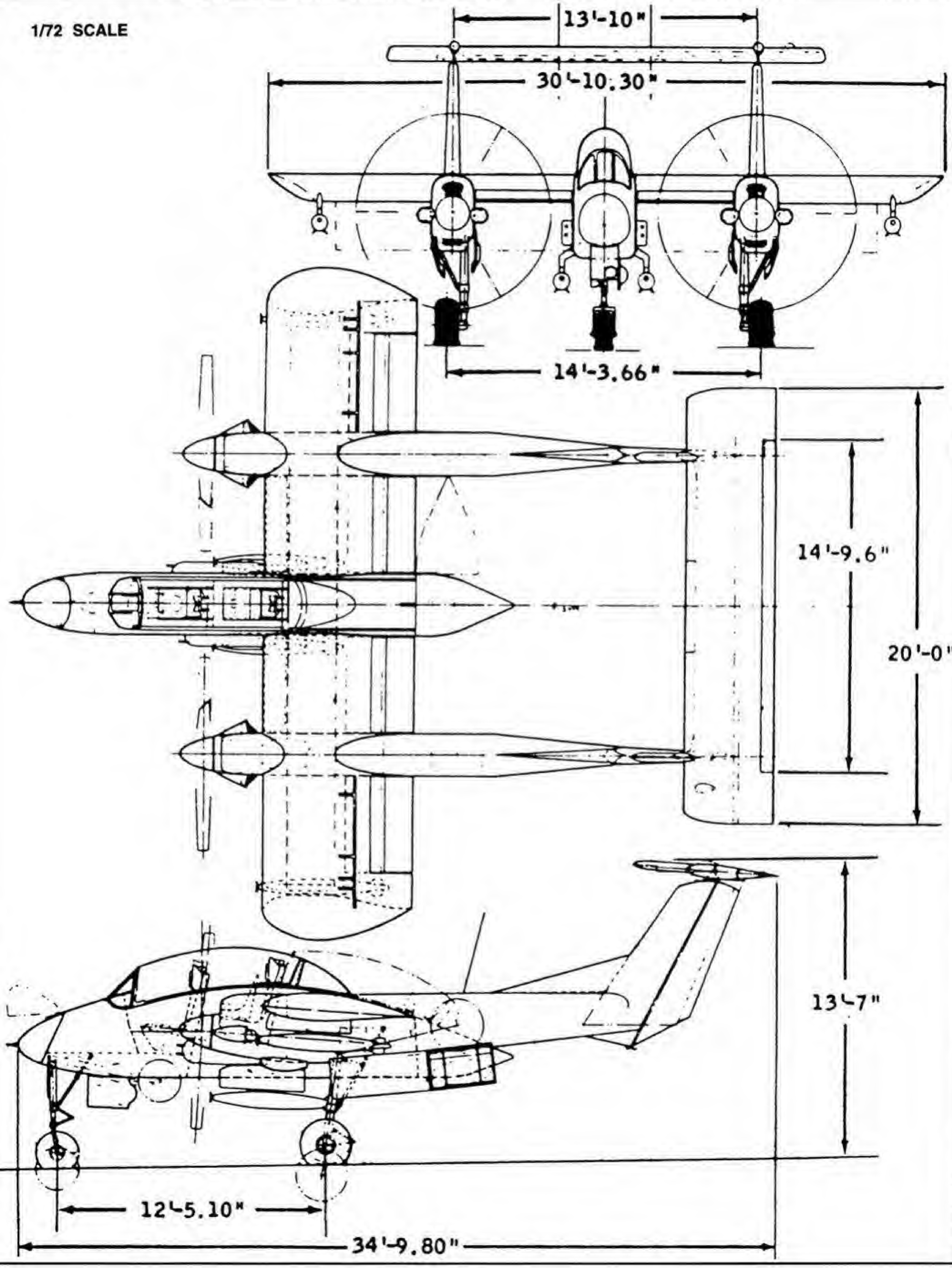
The tail group consisted of a stabilator, two fins and two rudders. The movable stabilator was of aluminum alloy construction, mounted at the top of the fins.The fins attached to the two booms which extended rearward from the wing. The stabilator was statically and dynamically balanced. The two fixed fins, of conventional design and planform, are of aluminum alloy stressed skin construction. Fin structures attach to the aft end of the booms, where a removable tip provided access to the controls. The rudders were of aluminum alloy construction and conventional design and planform. A geared tab was provided on each rudder.

FUSELAGE

The fuselage was of aluminum alloy, semi-monocoque construction. It consisted of one main body section containing belt-frames, longerons and stressed skin, with provisions for attaching the integral wing carry-through structure.

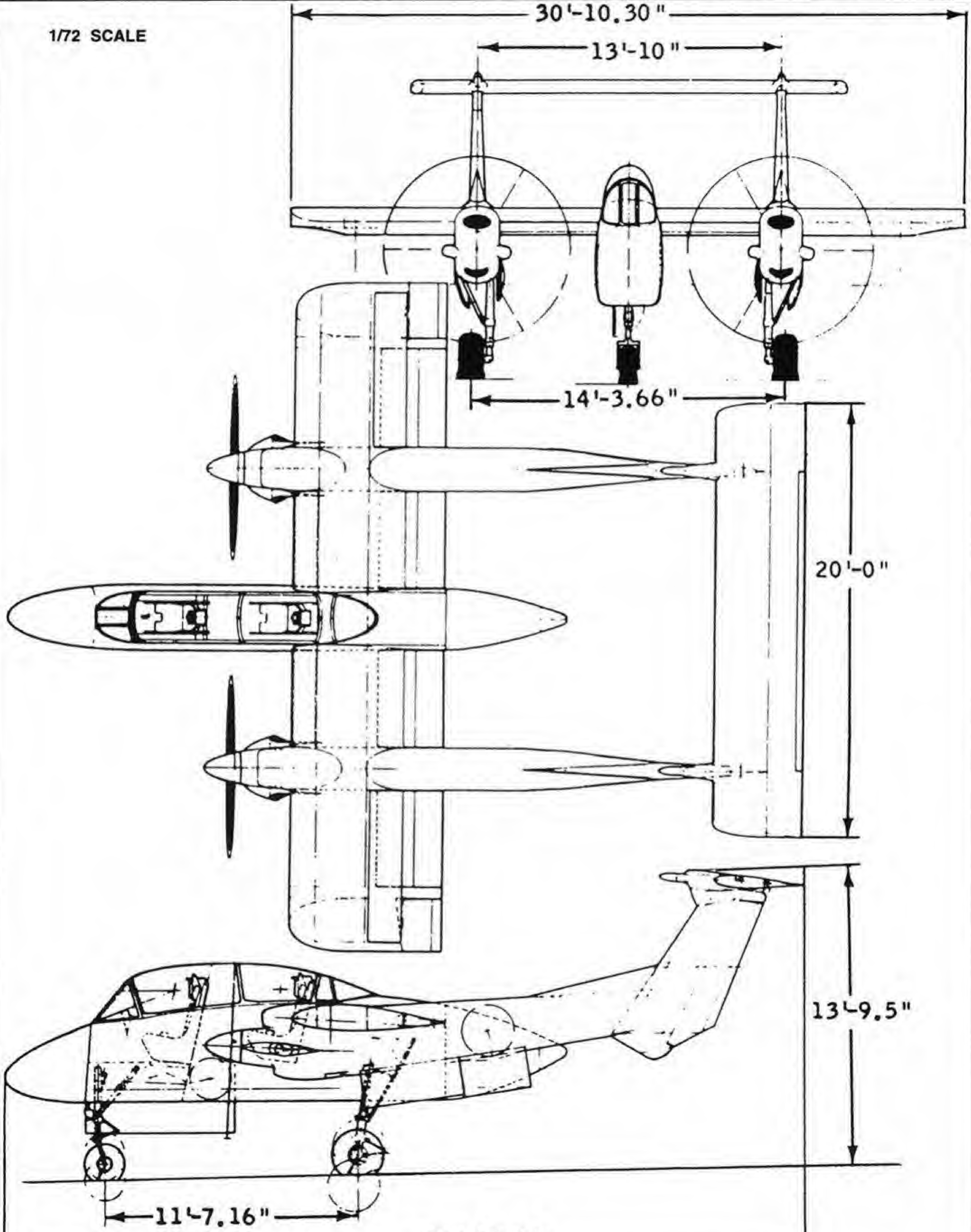
MODIFIED PROTOTYPE, CHARGER I LAYOUT

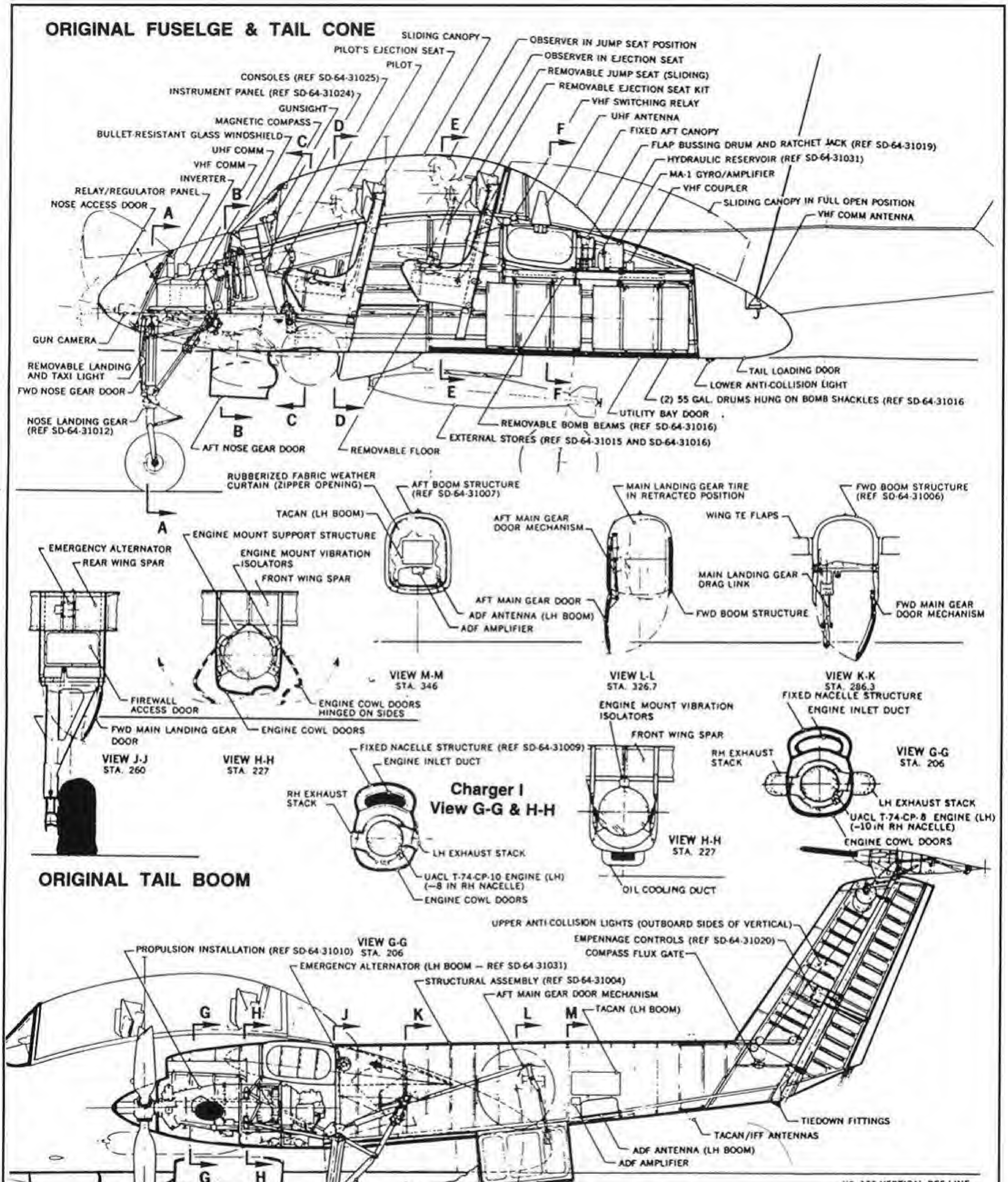
1/72 SCALE



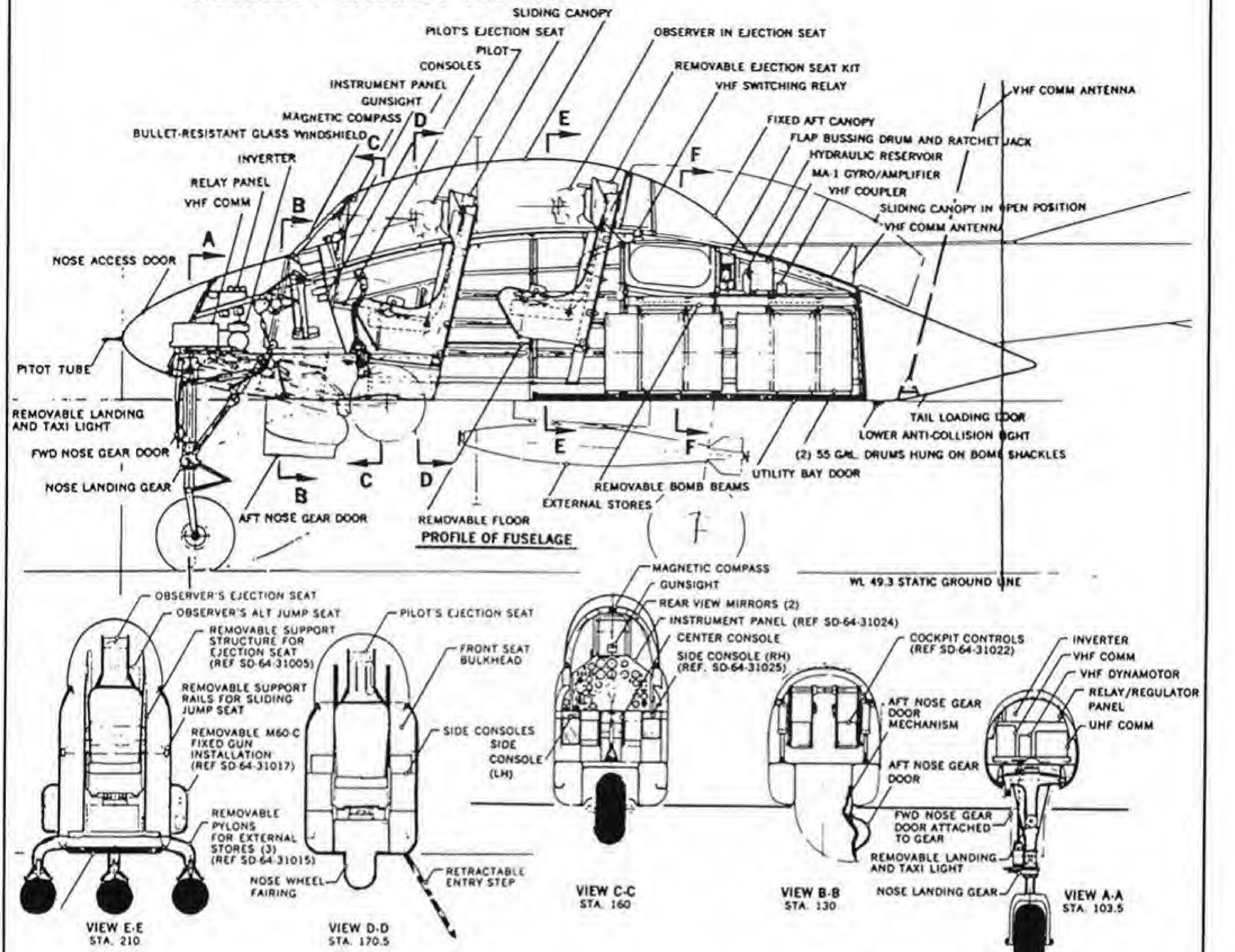
PROPOSED PRODUCTION VERSION, THE CHARGER II

1/72 SCALE

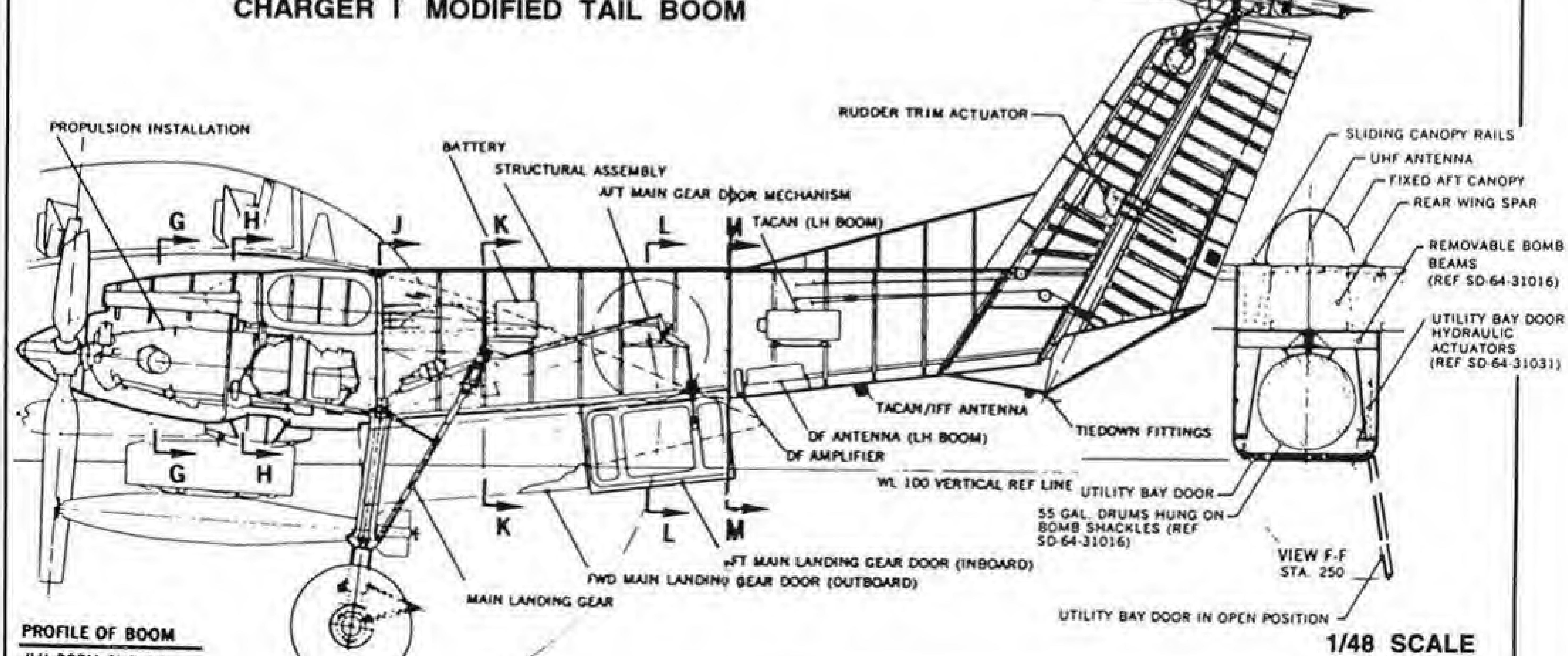



ORIGINAL FUSELGE & TAIL CONE
SLIDING CANOPY
PILOT'S EJECTION SEAT
PILOT
CONSOLES (REF SD-64-31025)
INSTRUMENT PANEL (REF SD-64-31024)
GUNSIGHT
MAGNETIC COMPASS
BULLET-RESISTANT GLASS WINDSHIELD
UHF COMM
VHF COMM
INVERTER
RELAY/REGULATOR PANEL
NOSE ACCESS DOOR
OBSERVER IN JUMP SEAT POSITION
OBSERVER IN EJECTION SEAT
REMOVABLE JUMP SEAT (SLIDING)
REMOVABLE EJECTION SEAT KIT
VHF SWITCHING RELAY
UHF ANTENNA
FIXED AFT CANOPY
FLAP BUSSING DRUM AND RATCHET JACK (REF SD-64-31019)
HYDRAULIC RESERVOIR (REF SD-64-31031)
MA-1 GYRO/AMPLIFIER
VHF COUPLER
SLIDING CANOPY IN FULL OPEN POSITION
VHF COMM ANTENNA
GUN CAMERA
REMOVABLE LANDING AND TAXI LIGHT
FWD NOSE GEAR DOOR
NOSE LANDING GEAR (REF SD-64-31012)
AFT NOSE GEAR DOOR
REMOVABLE FLOOR
EXTERNAL STORES (REF SD-64-31015 AND SD-64-31016)
REMOVABLE BOMB BEAMS (REF SD-64-31016)
UTILITY BAY DOOR
(2) 55 GAL. DRUMS HUNG ON BOMB SHACKLES (REF SD-64-31016
LOWER ANTI-COLLISION LIGHT
TAIL LOADING DOOR
A
B
C
D
E
F
J
RUBBERIZED FABRIC WEATHER CURTAIN (ZIPPER OPENING)
AFT BOOM STRUCTURE (REF SD-64-31007)
TACAN (LH BOOM)
ADF ANTENNA (LH BOOM)
ADF AMPLIFIER
VIEW M-M
STA. 346
MAIN LANDING GEAR TIRE IN RETRACTED POSITION
AFT MAIN GEAR DOOR MECHANISM
AFT MAIN GEAR DOOR
FWD BOOM STRUCTURE
VIEW L-L
STA. 326.7
FWD BOOM STRUCTURE (REF SD-64-31006)
WING TE FLAPS
MAIN LANDING GEAR DRAG LINK
FWD MAIN GEAR DOOR MECHANISM
VIEW K-K
STA. 286.3
EMERGENCY ALTERNATOR
REAR WING SPAR
FIREWALL ACCESS DOOR
FWD MAIN LANDING GEAR DOOR
VIEW J-J
STA. 260
ENGINE MOUNT SUPPORT STRUCTURE
ENGINE MOUNT VIBRATION ISOLATORS
FRONT WING SPAR
ENGINE COWL DOORS HINGED ON SIDES
ENGINE COWL DOORS
VIEW H-H
STA. 227
FIXED NACELLE STRUCTURE (REF SD-64-31009)
ENGINE INLET DUCT
RH EXHAUST STACK
Charger I
View G-G & H-H
LH EXHAUST STACK
UACL T-74-CP-10 ENGINE (LH) (—8 IN RH NACELLE)
ENGINE COWL DOORS
ENGINE MOUNT VIBRATION ISOLATORS
FRONT WING SPAR
VIEW H-H
STA. 227
OIL COOLING DUCT
FIXED NACELLE STRUCTURE
ENGINE INLET DUCT
RH EXHAUST STACK
VIEW G-G
STA. 206
LH EXHAUST STACK
UACL T-74-CP-8 ENGINE (LH) (-10 IN RH NACELLE)
ENGINE COWL DOORS
ORIGINAL TAIL BOOM
UPPER ANTI-COLLISION LIGHTS (OUTBOARD SIDES OF VERTICAL)
EMPENNAGE CONTROLS (REF SD-64-31020)
COMPASS FLUX GATE
PROPULSION INSTALLATION (REF SD-64-31010)
VIEW G-G
STA. 206
EMERGENCY ALTERNATOR (LH BOOM — REF SD-64 31031)
STRUCTURAL ASSEMBLY (REF SD-64-31004)
AFT MAIN GEAR DOOR MECHANISM
TACAN (LH BOOM)
G
H
J
K
L
M
TIEDOWN FITTINGS
TACAN/IFF ANTENNAS
ADF ANTENNA (LH BOOM)
ADF AMPLIFIER
WL 100 VERTICAL REF LINE
AFT MAIN LANDING GEAR DOOR (INBOARD)
FWD MAIN LANDING GEAR DOOR (OUTBOARD)
MAIN LANDING GEAR (REF SD-64-31011)
1/48 SCALE

CHARGER I MODIFIED TAIL CONE

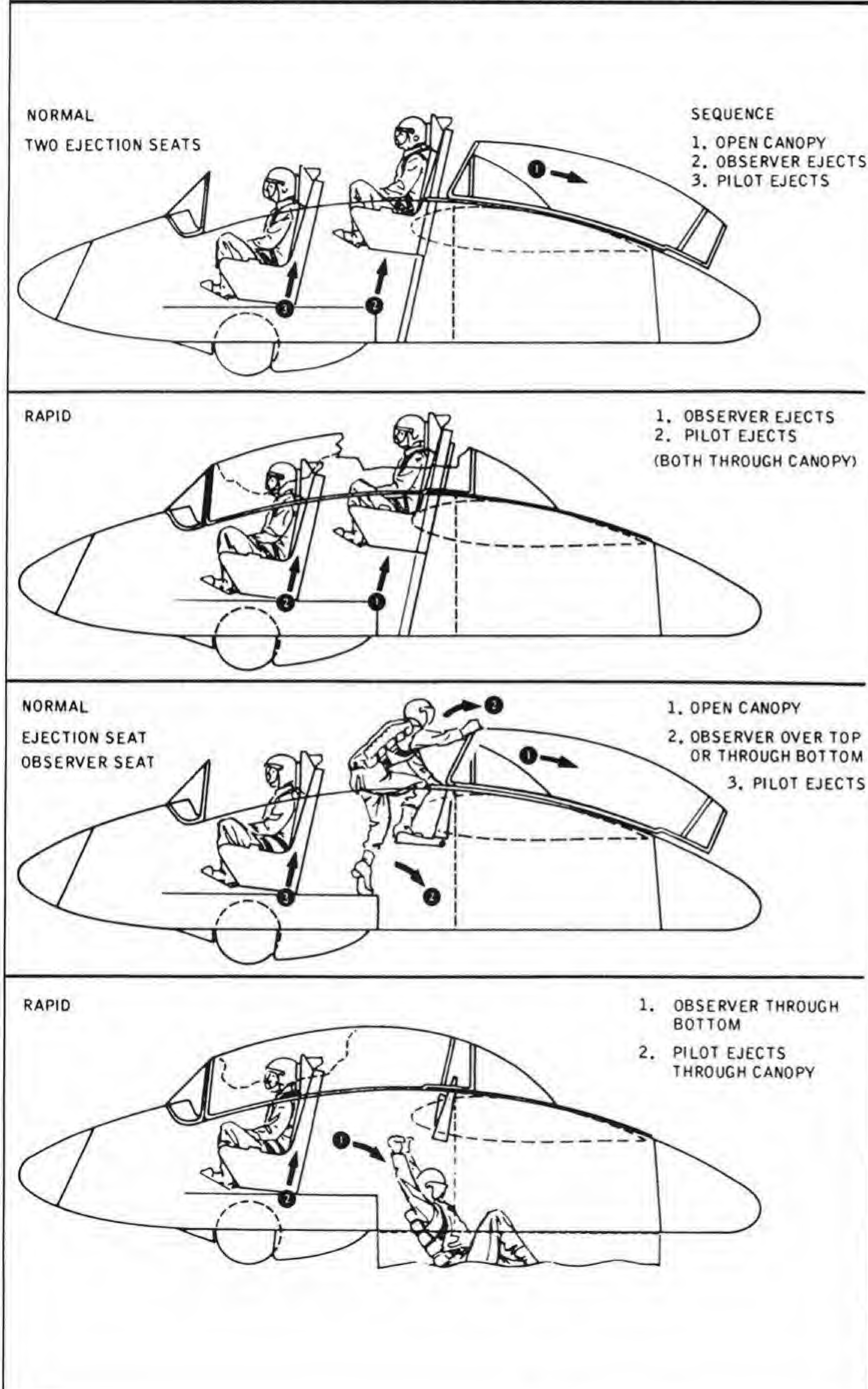


CHARGER I MODIFIED TAIL BOOM



1/48 SCALE

EMERGENCY ESCAPE PROCEDURES



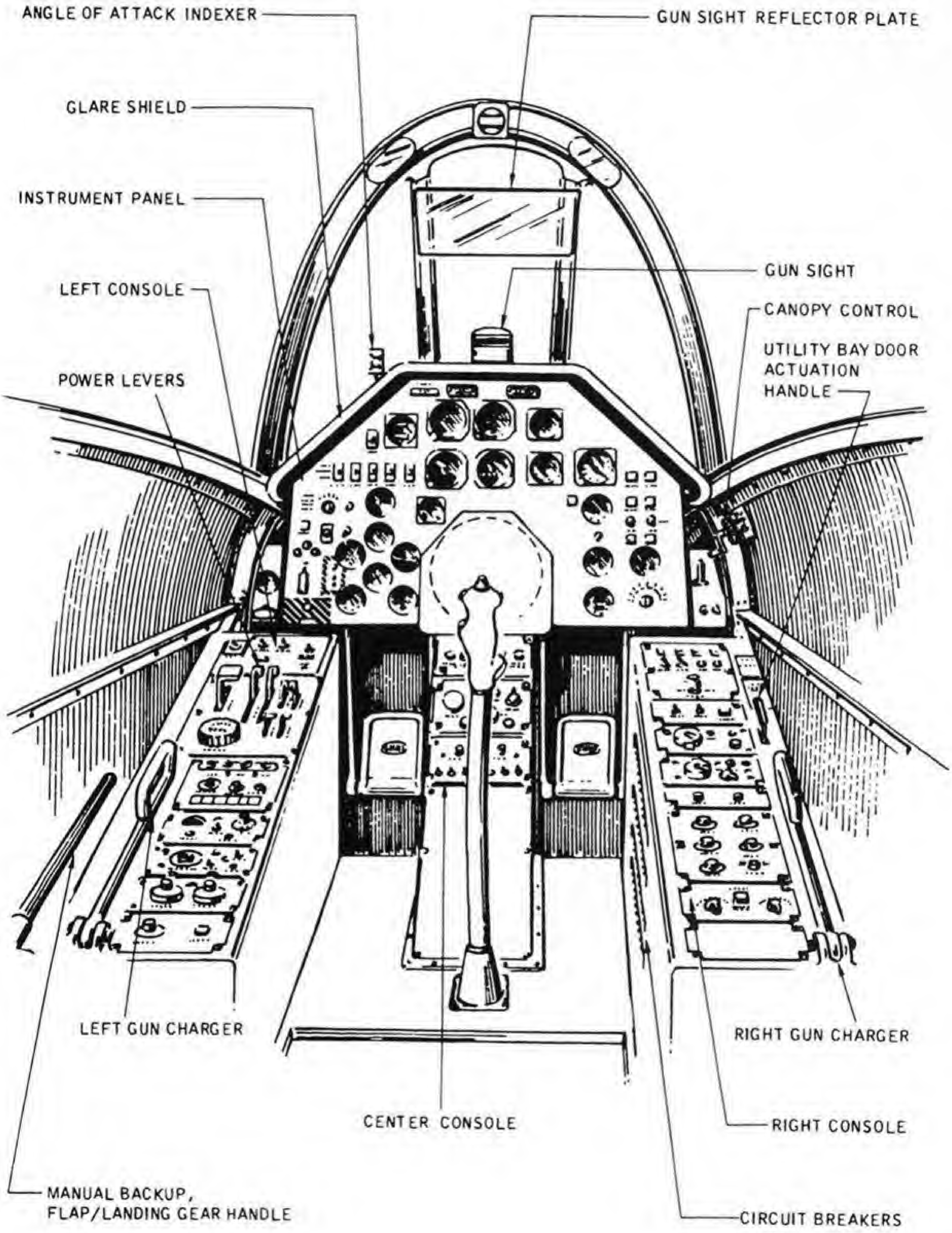
CREW STATIONS

Cockpits were for one pilot and one observer. During missions with only the pilot, the aft ejection seat would be removed and the space utilized for cargo, stores or litter patients. The one piece aft sliding canopy permitted the crew easy access and exit. The sliding canopy could be opened in flight to a position approximately midway between the pilot's and observer's position at speeds up to 150 knots. Opening beyond the mid position was possible on the ground for observer access and in the air for emergency escape.

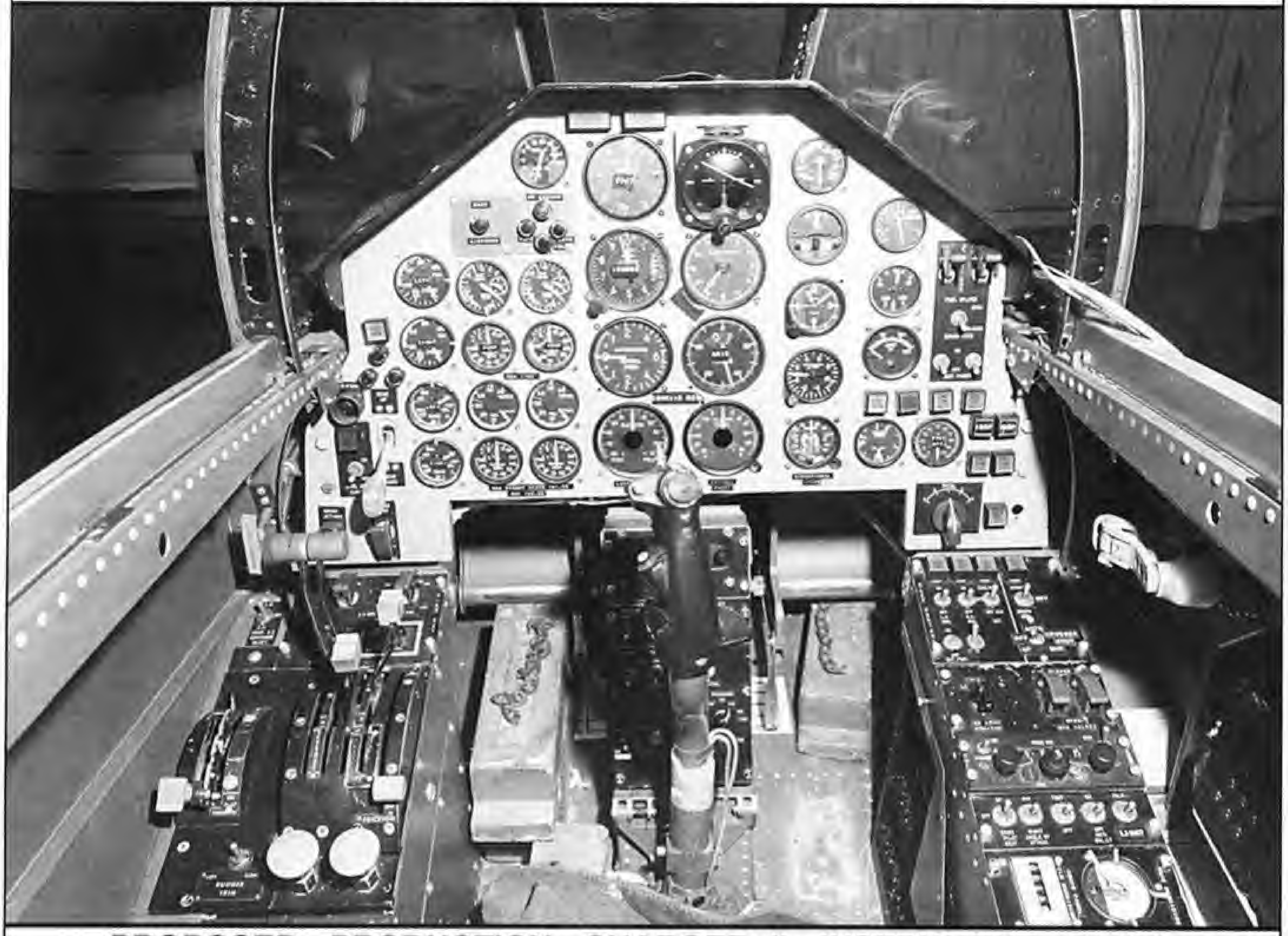
CARGO BAY

This compartment could carry 2,000 pounds of cargo or equipment and had a downward swinging door and a sideward swinging tail cone. It was designed to facilitate loading and unloading of high-density cargos in the field without special cradles, jacks or dollies. A removable cargo compartment floor was provided as part of the cargo kit. It could withstand actual deadweight loading of 200 lb. per sq. ft. The flooring permitted easy movement of cargo throughout the compartment.

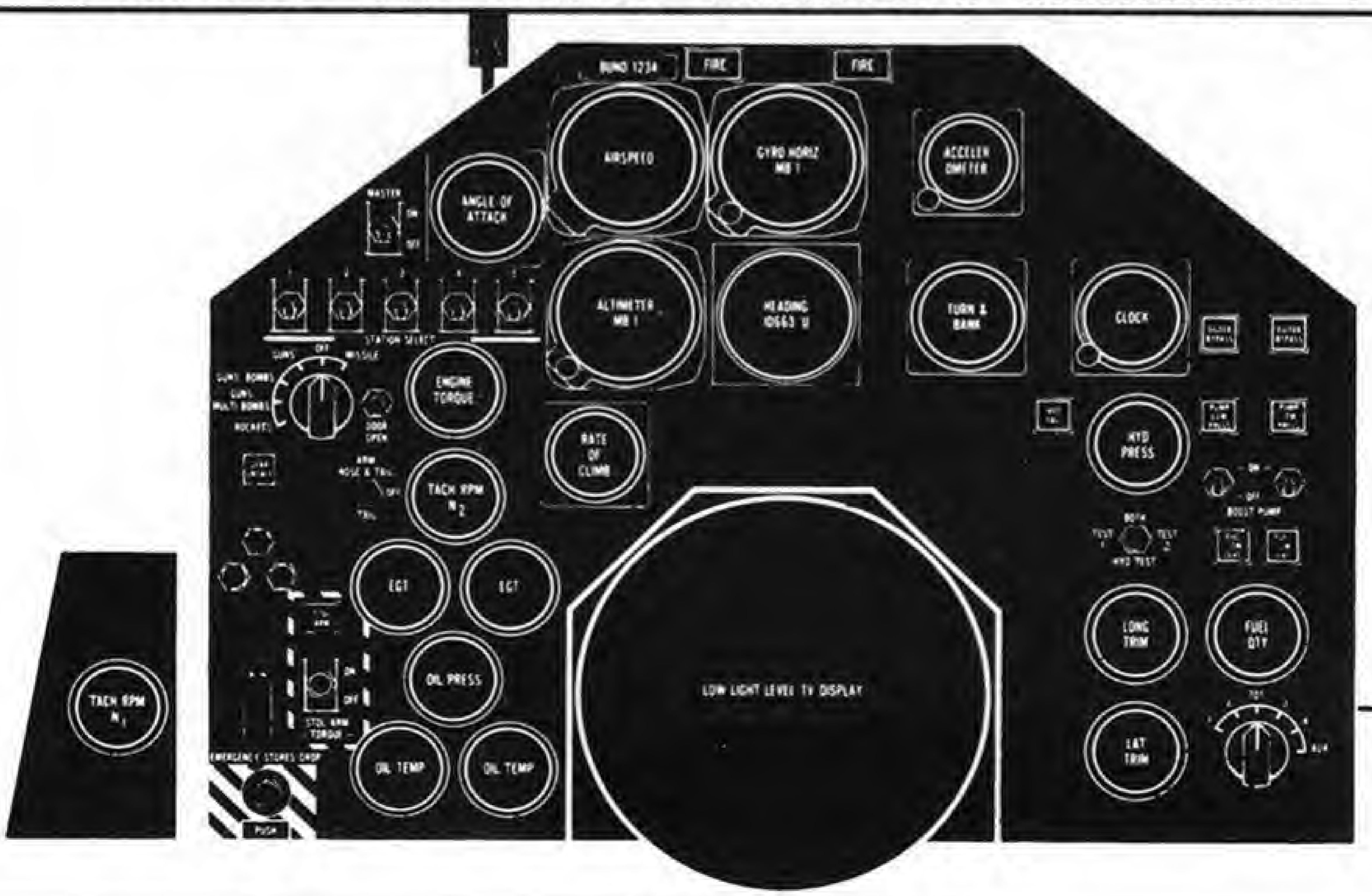
GENERAL COCKPIT LAYOUT OF THE PROPOSED CHARGER II



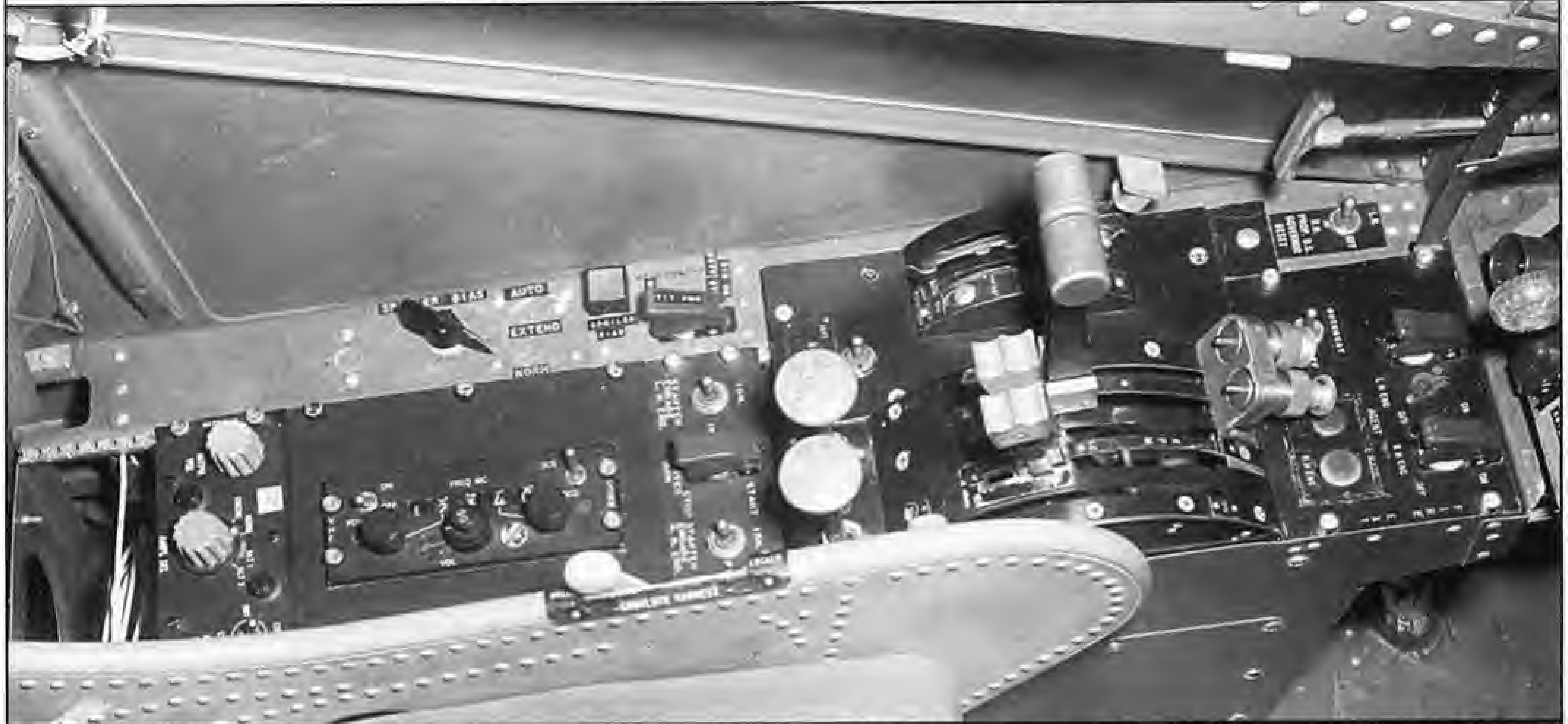
PROTOTYPE FORWARD COCKPIT AND INSTRUMENT PANEL



PROPOSED PRODUCTION CHARGER II INSTRUMENT PANEL

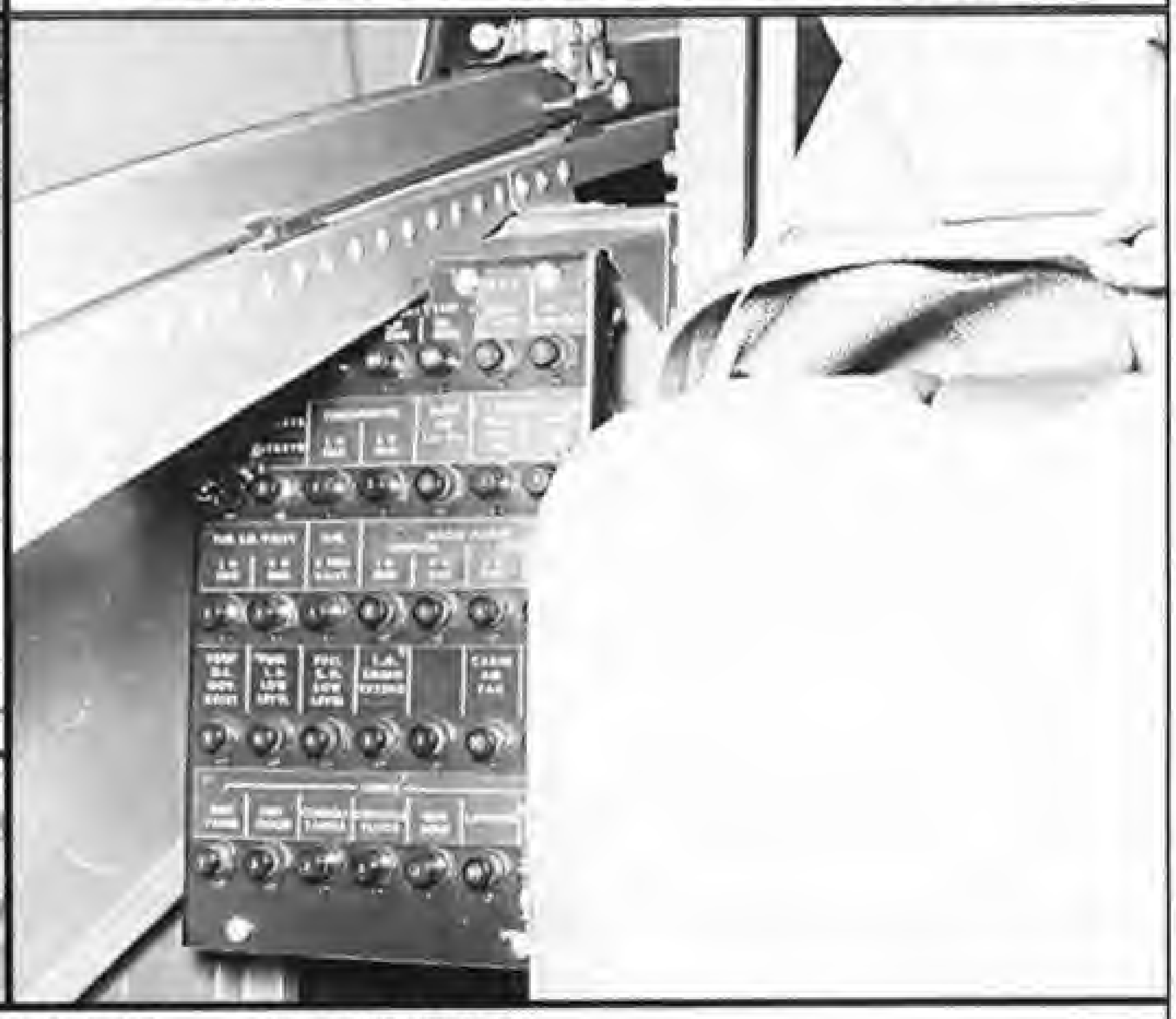


LEFT HAND PILOT'S CONSOLE

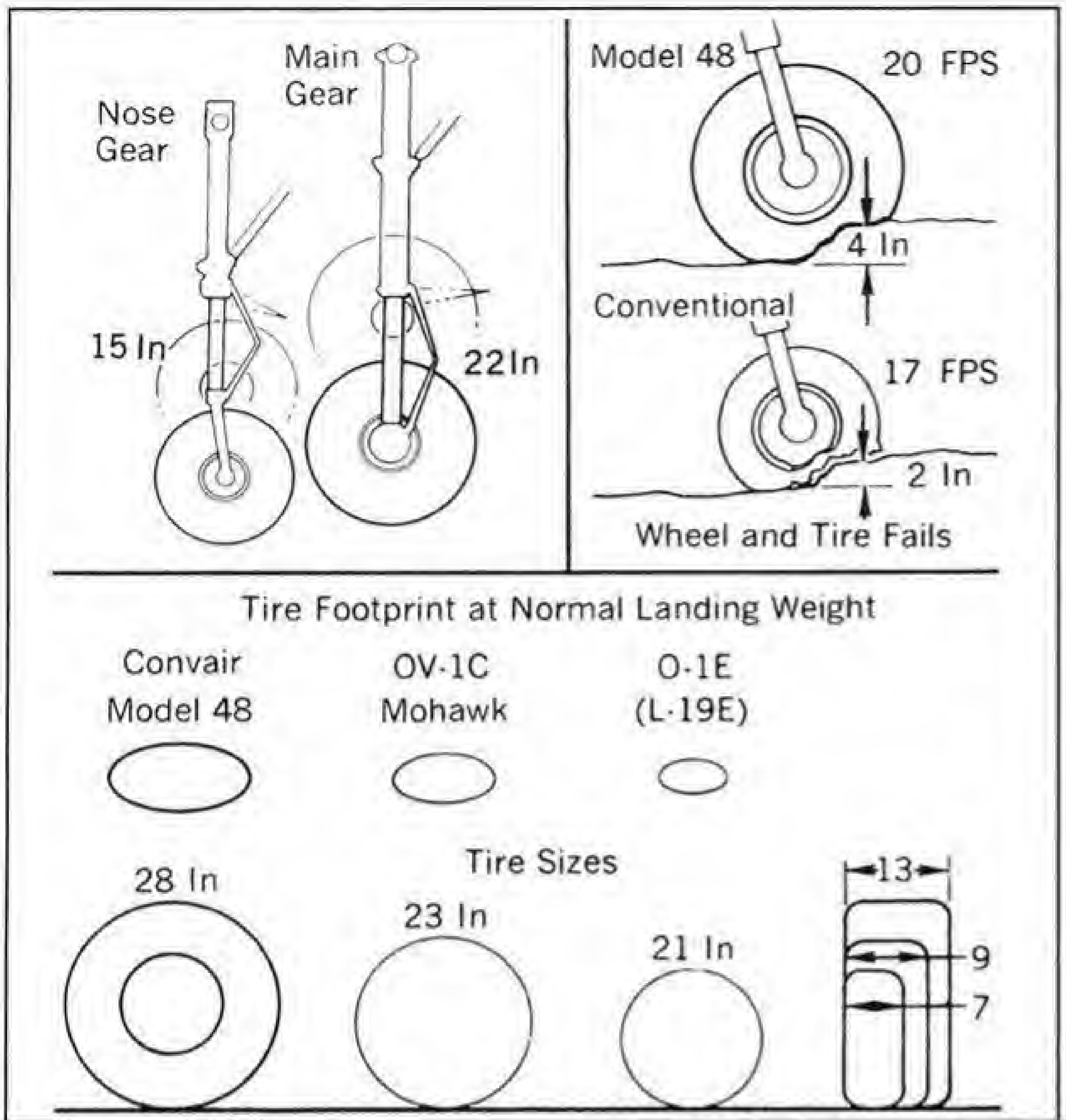


PROTOTYPE TEST PANEL

RIGHT AFT CIRCUIT BREAKERS



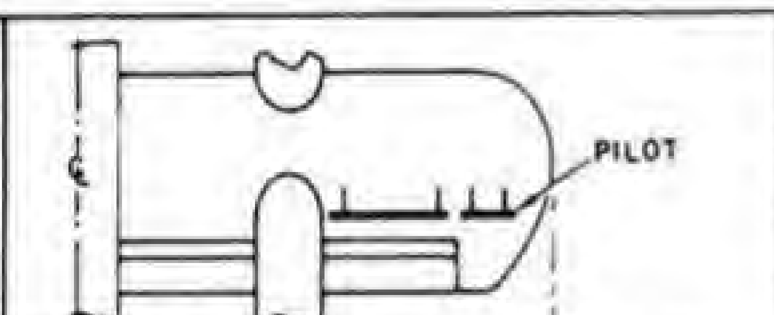
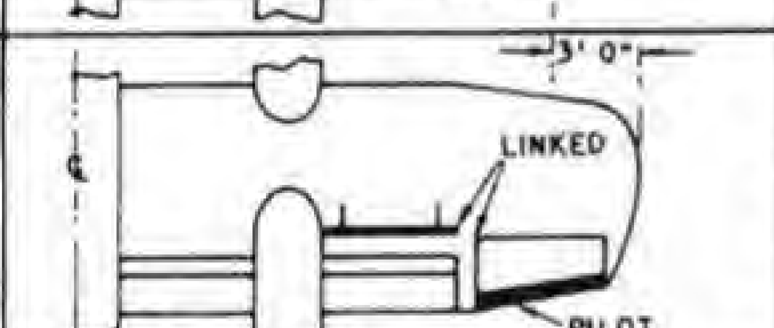
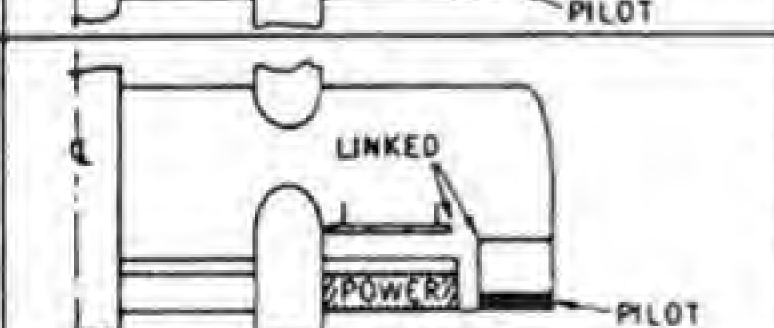
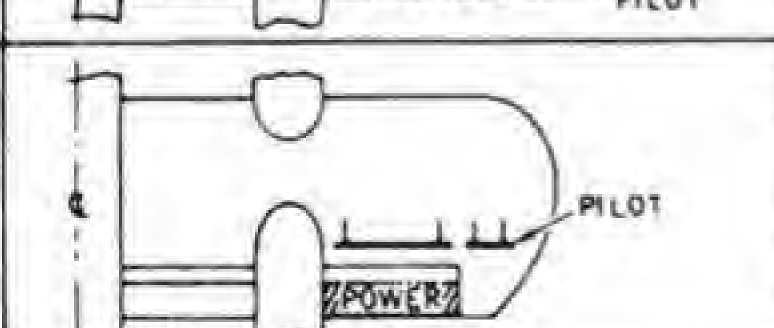
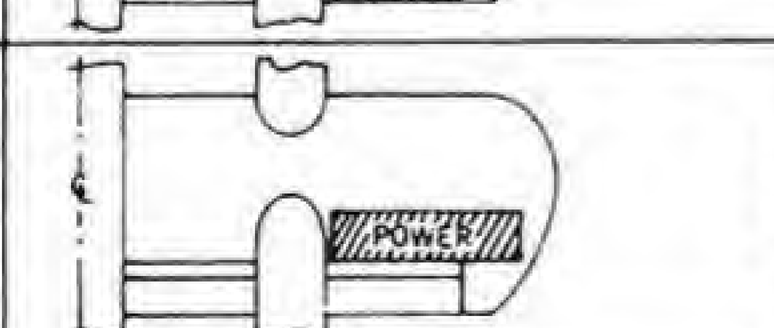
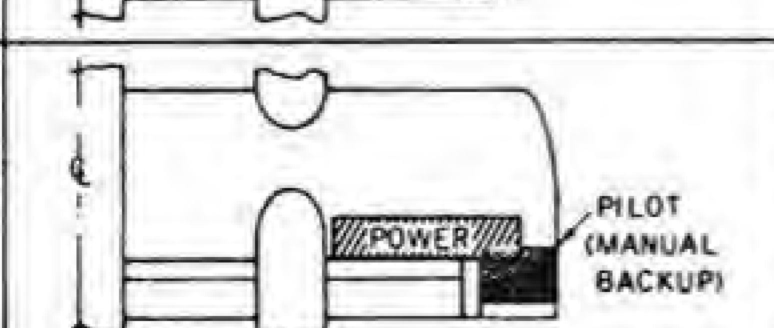
RIGHT HAND PILOT'S CONSOLE



LANDING GEAR

The landing gear was of the retractable tricycle type. The tread of the main landing gear was 14 feet 3.6 inches. This provided optimum stability during landing and takeoff. The main landing gear was mounted at each engine nacelle. Each gear consisted of a single oleo pneumatic strut, one wheel with brakes, mounted on an offset axle with the necessary support structure and retracting mechanism. Redundancy of the landing gear down actuation was provided to permit operation in the event of primary system failure.

The Charger was designed to negotiate 4-inch bumps in rough fields during 20-fps landing impacts, with the gear fully compressed. This requirement was met by providing a large stroke in the nose and main-gear shock struts and by using large low-pressure tires to absorb the bumps. These tires provided an extremely low UCI (unit construction index) of only 6.5 for the gross weight of a typical mission. Nosewheel steering, coupled with the large tire footprint area, permitted operation in deep mud.

LATERAL CONTROL SYSTEM STUDIES			ROLL ACCELER. DEG./SEC.	WEIGHT LB.	FLYING QUALITY	SPEED BRAKES
① PROTOTYPE		PILOT ACTUATES CIRCULAR ARC SPOILER DIRECTLY	23	-0-	HIGH INERTIA AND VARIABLE FEEL FORCES	NOT EVALUATED ON AIRCRAFT
② AERODYNAMIC AILERON AND SPOILER		PILOT ACTUATES AILERON TAB. TAB FLIES AILERON AND SPOILER	40	+ 152	LOW INERTIA AND ACCEPTABLE FEEL FORCES	ADDITIONAL SYSTEM REQUIRED + 55 LB.
③ POWER FLAPERON AND AERODYNAMIC AILERON AND SPOILER		PILOT ACTUATES AILERON TAB AND SERVO VALVE. TAB FLIES AILERON AND SPOILER. SERVO VALVE ACTUATES SINGLE HYD. SYSTEM RAM WHICH OPERATES FLAPERON.	47	+ 81	LOW INERTIA AND ACCEPTABLE FEEL FORCES	ADDITIONAL SYSTEM REQUIRED + 55 LB.
④ POWER FLAPERON AND AERODYNAMIC SPOILER		PILOT ACTUATES CIRCULAR ARC SPOILER AND SERVO VALVE. SERVO VALVE ACTUATES SINGLE HYD. SYSTEM RAM WHICH OPERATES FLAPERON.	42	+ 40	HIGH INERTIA AND VARIABLE FEEL FORCES	ADDITIONAL SYSTEM REQUIRED + 55 LB.
⑤ POWER "FLAP TYPE" SPOILER		PILOT ACTUATES DUAL HYD. SYSTEM SERVO VALVES. SERVO VALVES ACTUATE TANDEM RAM WHICH PROGRESSIVELY OPERATES SEGMENTED "FLAP TYPE" SPOILERS	62	+ 58	LOW INERTIA AND IDEAL FEEL FORCES	SPEED BRAKE INCORPORATED IN SYSTEM
⑥ POWER "FLAP TYPE" SPOILER WITH MANUAL BACKUP AILERON		PILOT ACTUATES SINGLE HYD. SYSTEM SERVO VALVE (AILERON LOCKED OUT). SERVO VALVE ACTUATES RAM WHICH OPERATES FLAP TYPE SPOILER. LOSS OF HYD. POWER ENGAGES AILERON FOR MANUAL BACKUP	62	+ 108	LOW INERTIA AND IDEAL FEEL FORCES	SPEED BRAKE INCORPORATED IN SYSTEM

FLIGHT CONTROL SYSTEMS

The flight control system used manually operated aerodynamic controls. The primary flight control system consisted of conventional cable systems for the longitudinal, lateral, and directional systems. No mechanical backup system was provided.

During the prototype flight test program, flight control systems were evaluated in the STOL mode and throughout the high speed envelope. The modular/commonality concept of the aircraft permitted ready evaluation of: (1) inboard and outboard ailerons and Krueger flaps; (2) circular arc spoiler span effects; (3) various engine rotation combinations; (4) spoiler contour, lip and bias effects; (5) various rudder sizes and tab gearing ratios; (6) various stabilator pivot locations and camber ratios; and (7) various flap settings, configurations and camber ratios.

After analysis of the data from the Convair, NASA and military flight programs, several control system revisions were incorporated. The longitudinal and flap systems were considered acceptable. The directional control system, when supplemented by a yaw damper/turn coordinator system and revised rudder pedal adjustment, became acceptable.

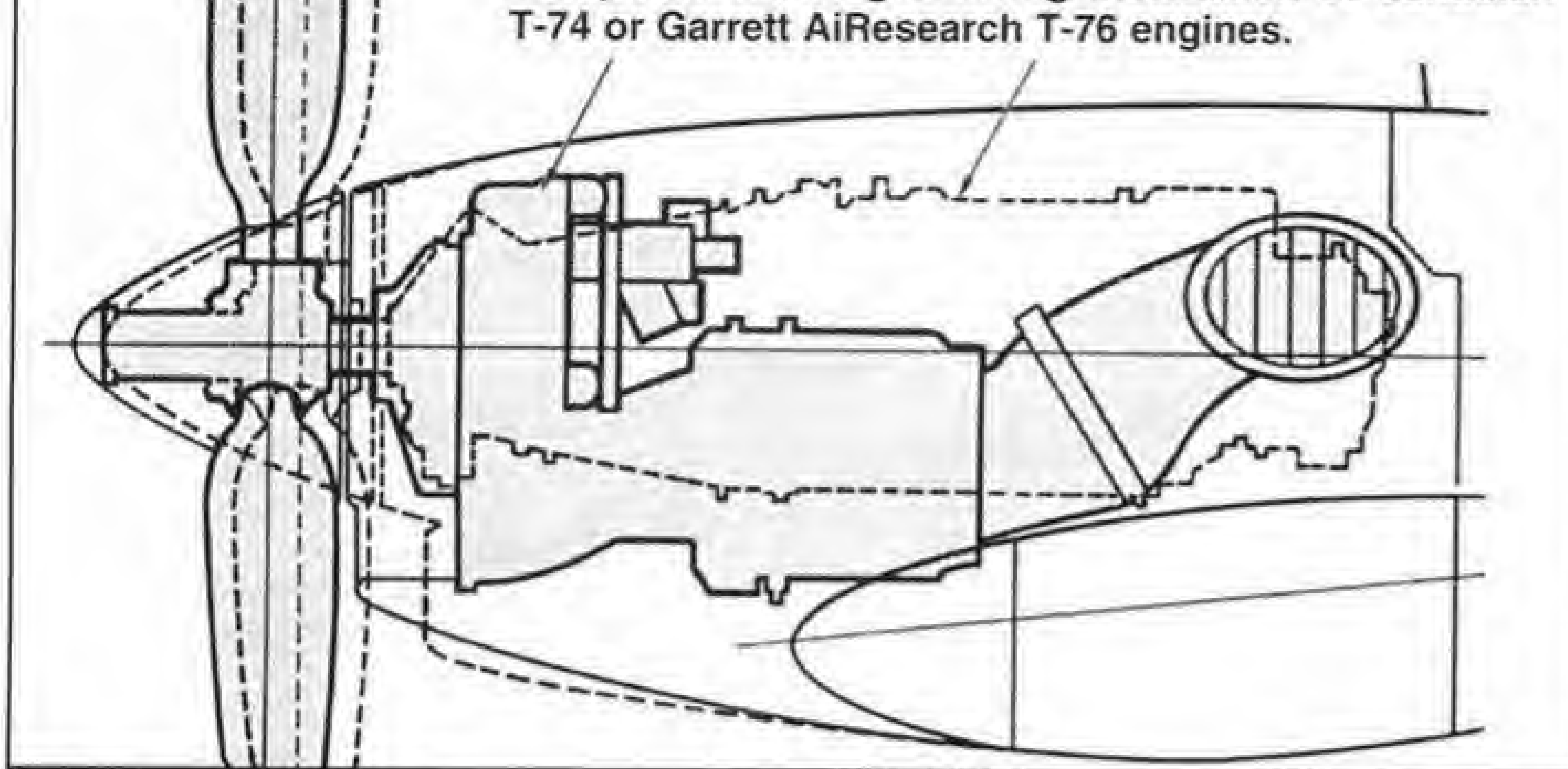
Changes in the Charger's lateral control system would provide approximately three times the lateral control power that existed on the Charger prototype. The Charger prototype exhibited unacceptable roll acceleration, poor stick force harmony characteristics, and poor single-engine control capability. Detailed tradeoff studies were performed on various system combinations to select the optimum control system for the Charger II. The table at left compares the various control systems.

System 6 provided the best reliability and cost in addition to providing good roll response characteristics with good force characteristics, and the lateral control margin for single-engine operation would be greatly improved. This system would give the Charger II a 50% lateral control margin at 70 knots with one engine out.

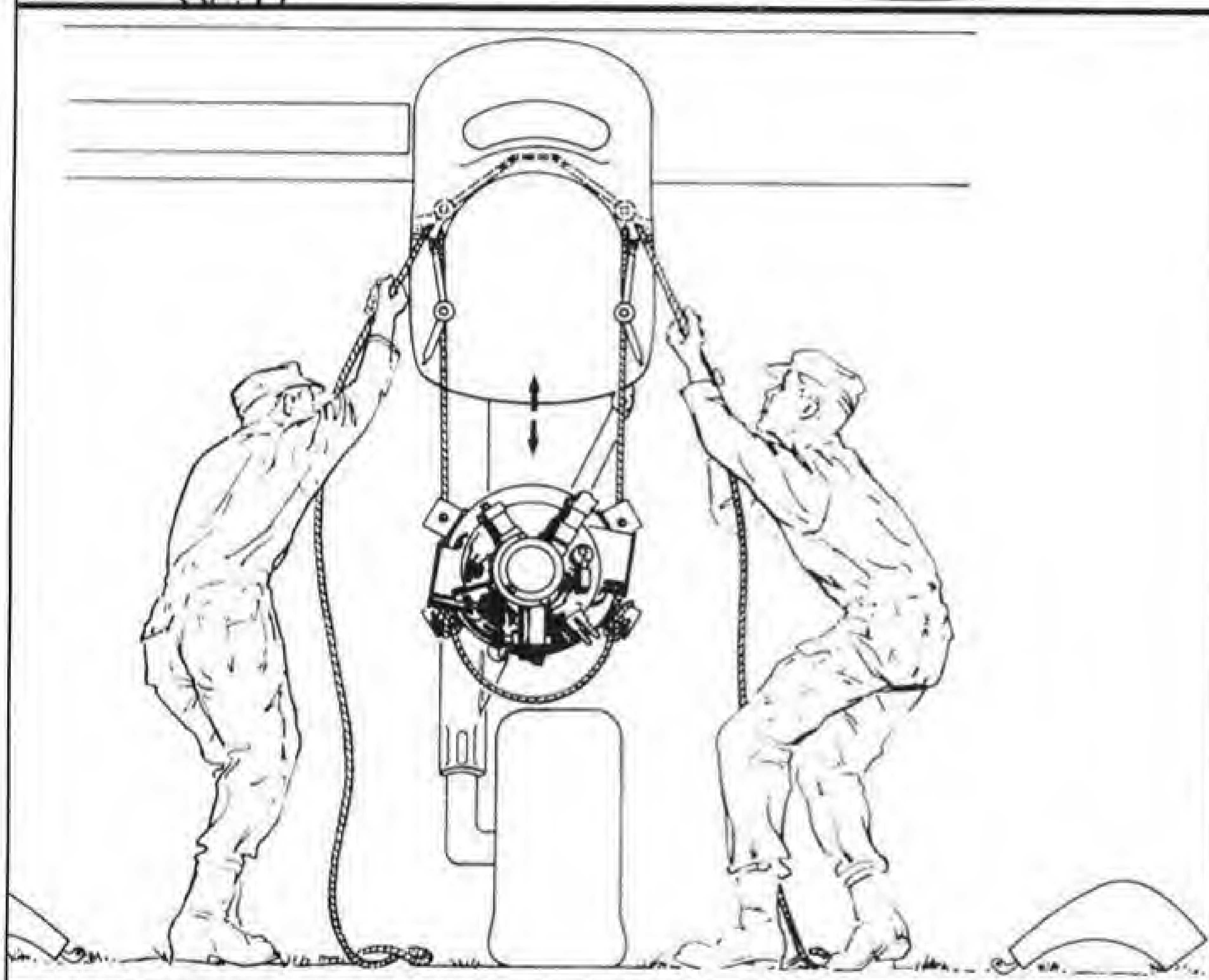
The Charger II lateral control system would consist of a hydraulically powered flap-type spoiler/speed brake, and a manual backup, servo-geared tip aileron operated from the control stick through a closed cable loop system. Lateral trim was to be obtained through electro-mechanical actuators, which deflected the servo-geared tip aileron with feel provided by a centering/feel cam.

Above, prototype outboard trailing edge flap assembly during fabrication at VAT 69. (via Jim Fink)

Below, flap system installed on the left wing. This was the 60°/30° position Convair engineers thought would be used in the normal landing configuration. The inboard flaps were identical but did not incorporate the servo tabs. (via Jim Fink)



Composite drawing showing installation of Canadian T-74 or Garrett AiResearch T-76 engines.



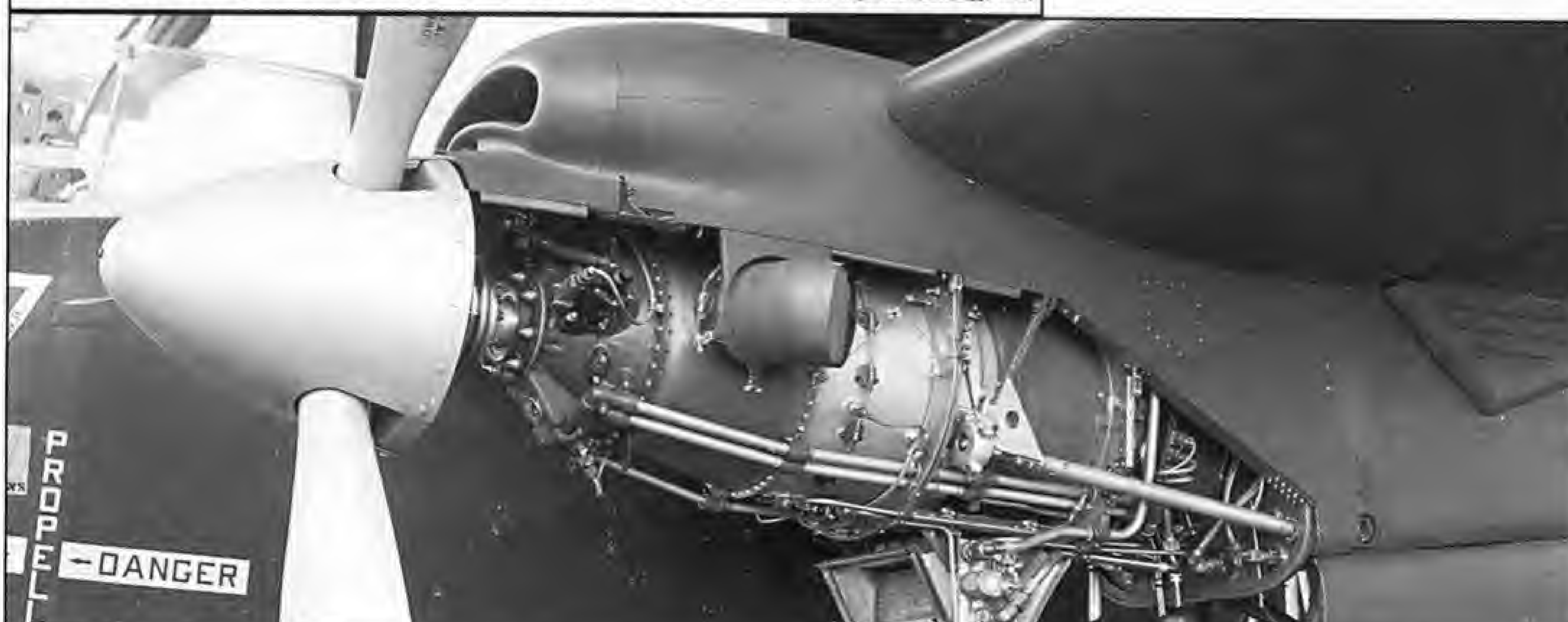
MAIN PROPULSION UNITS

The Charger was powered by United Aircraft of Canada's YT-74-CP-8 (PT6A-24) turboprop engines. Initially the engines were rated at 550 shaft horsepower, but by the end of the program the engine's performance had been increased to 750 shaft horse power at 2,200rpm.

Engine mounts were attached to the nacelle so as to be completely detachable and reinstallable without the use of jigs. Dowel pins or equivalent mounts were provided to facilitate aligning engine mount bolt holes when installing the power plant unit. The engine mounts offer no interference to the installation and removal of the power plant as a unit.

Each engine was equipped with a combination starter-generator. A variable displacement hydraulic pump is provided on each engine for pressurizing the hydraulic system. Two tachometer generators are provided on each engine for the N_P and N_G rotors. A torquemeter transmitter is provided on each engine.

One fixed air intake was provided on the top of each nacelle forward of the leading edge to direct air to a plenum chamber.The engine inlet includes an air inlet screen.

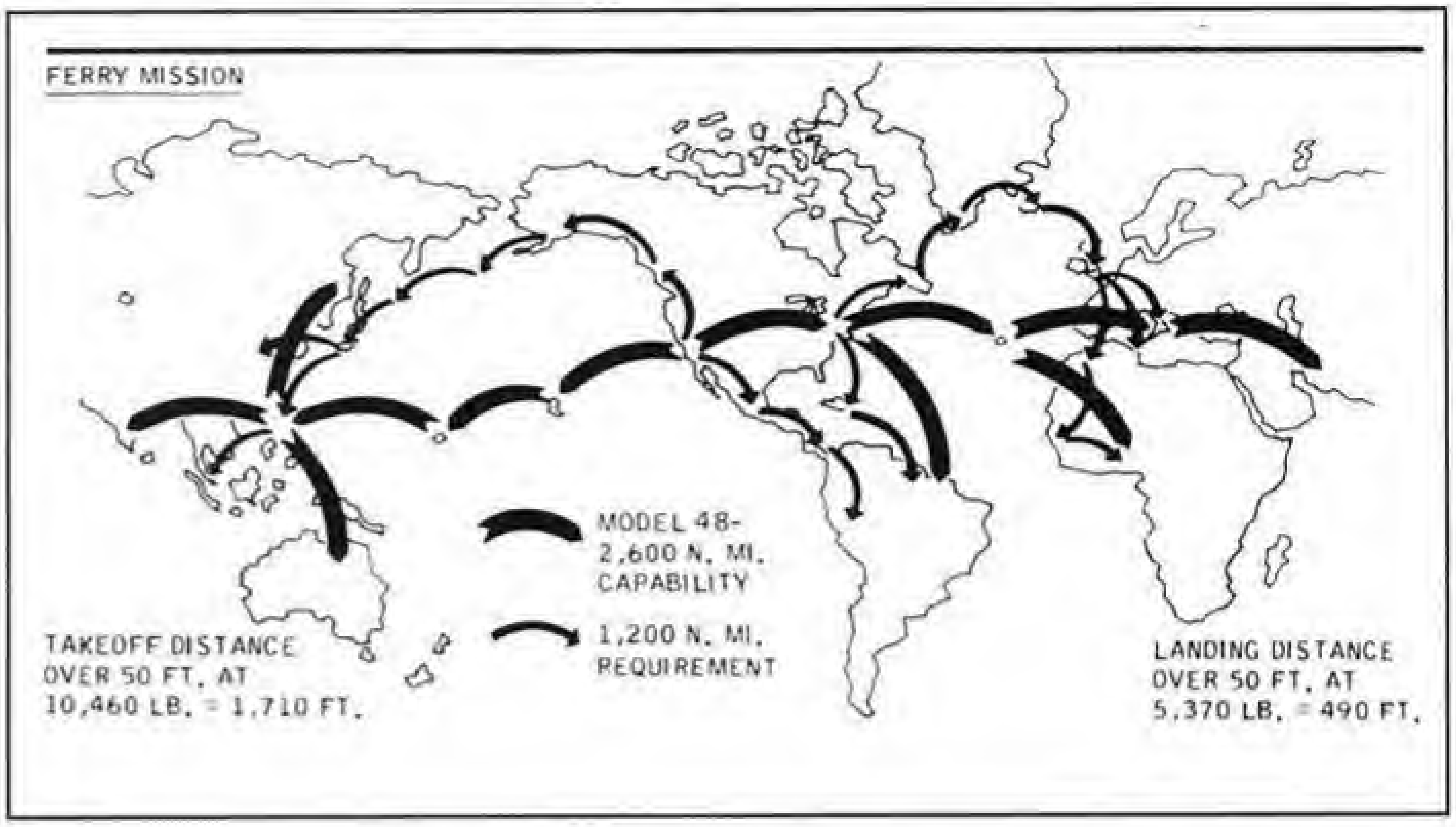


T-74/PT6A TURBOPROP ENGINE INSTALLATION

LUBRICATING AND FUEL SYSTEMS

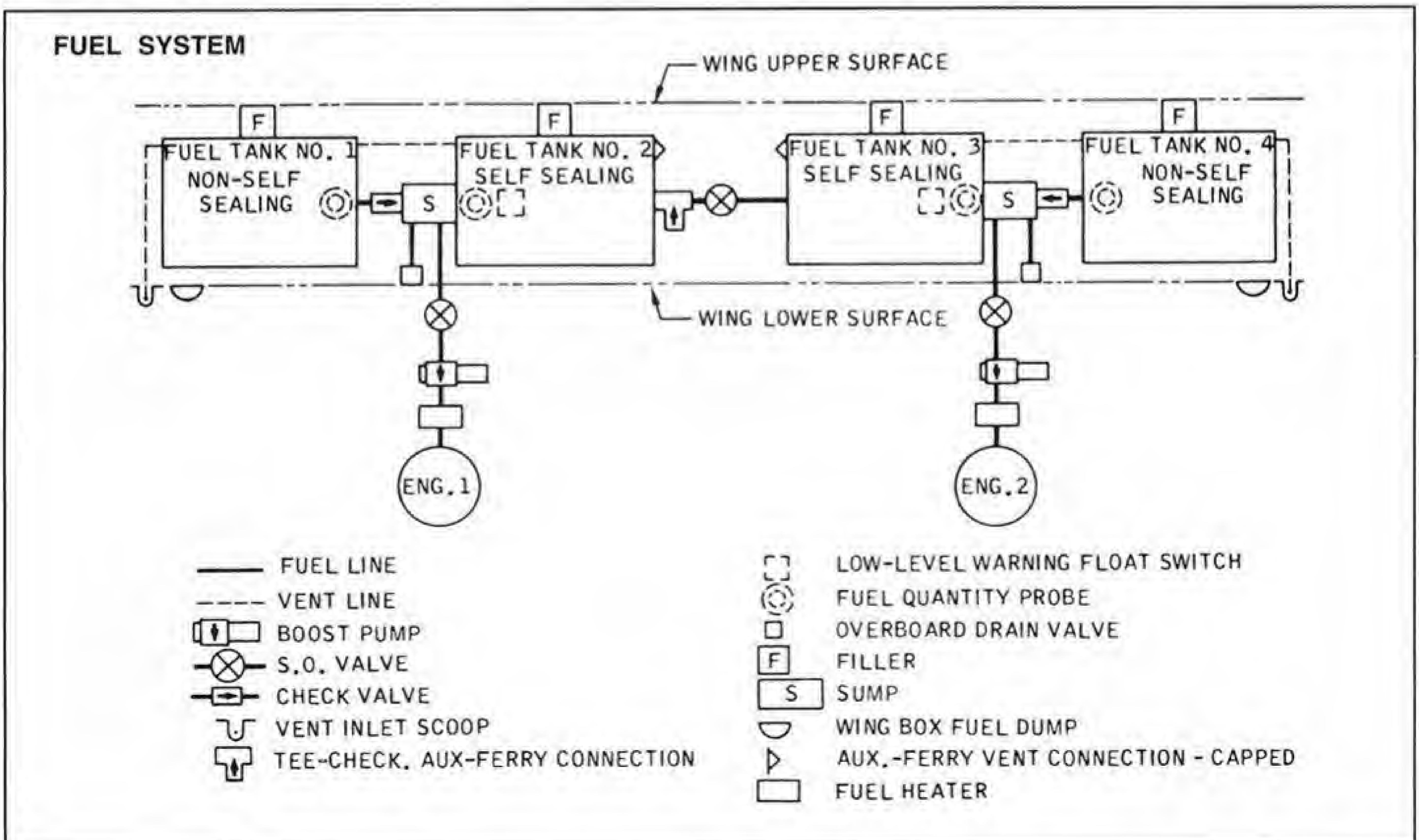
LUBRICATING SYSTEM

The lubricating system was an integral part of the engine. An air-oil cooler provided for oil temperature control. Ready access was provided to the gravity filler cap. The usable oil quantity was measured with a flexible dipstick contained as part of the engine oil fillercap. Oil pressure transmitters and oil temperature bulbs were provided.



FUEL SYSTEM

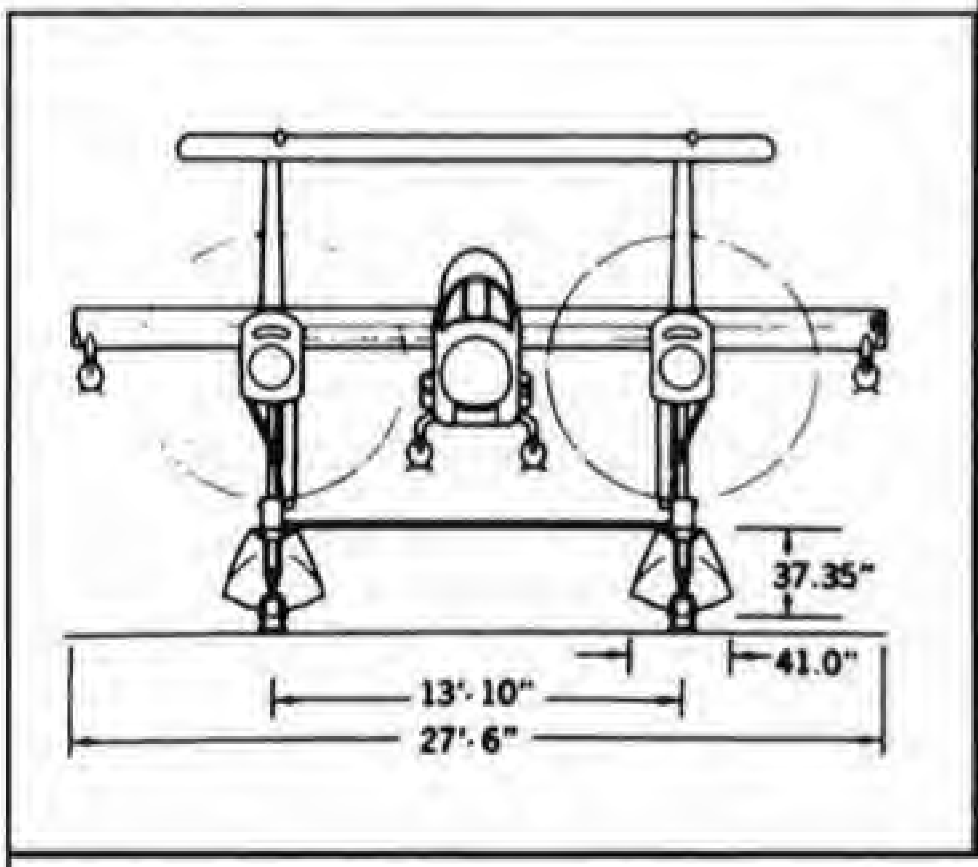
The fuel system was designed to use JP-4 or JP-5 jet fuel. In emergencies, aviation gasoline or automotive gasoline could also be used with a resultant loss of performance. The usable fuel capacity was figured on the use of JP-4 fuel. The system included four non-selfsealing fuel cells in the wing interspar area outboard of the fuselage. All four fuel tanks were completely interchangeable. Each engine was fed directly from a separate fuel feed tank through two boost pumps located in the fuel feed tank. Each fuel tank was fed directly from a separate fuel transfer tank through a transfer pump in the fuel transfer tank. An accumulator operated by the aircraft hydraulic system was provided to satisfactorily meet the requirements of fuel availability during maneuvering and landing. A warning light was provided to indicate low tank level, in addition to a fuel quantity indicator. The engine fuel feed shutoff valves were electrically operated and controlled from the cockpit. Extra auxiliary fuel could be contained in a 240-gallon internal fuel tank or in one 150 gallon drop tank located on the left fuselage pylon. For ferry missions, a 300 gallon internal fuel tank could replace the 240 gallon auxiliary tank, and another 150 gallon drop tank could be added to the right fuselage pylon. The basic fuel system, plus the auxiliary fuel tanks, held enough fuel for a 2,600 nautical mile mission.

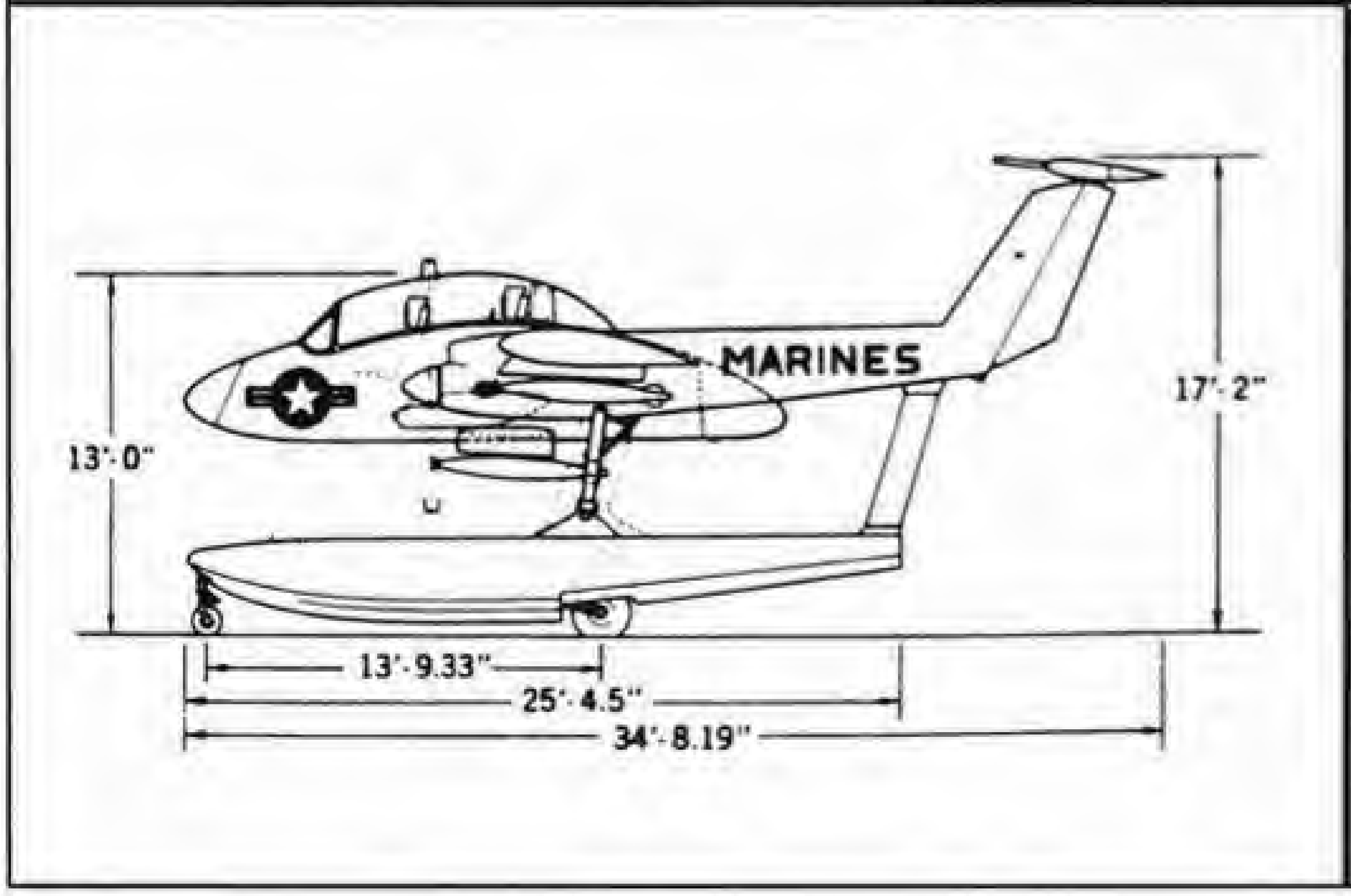


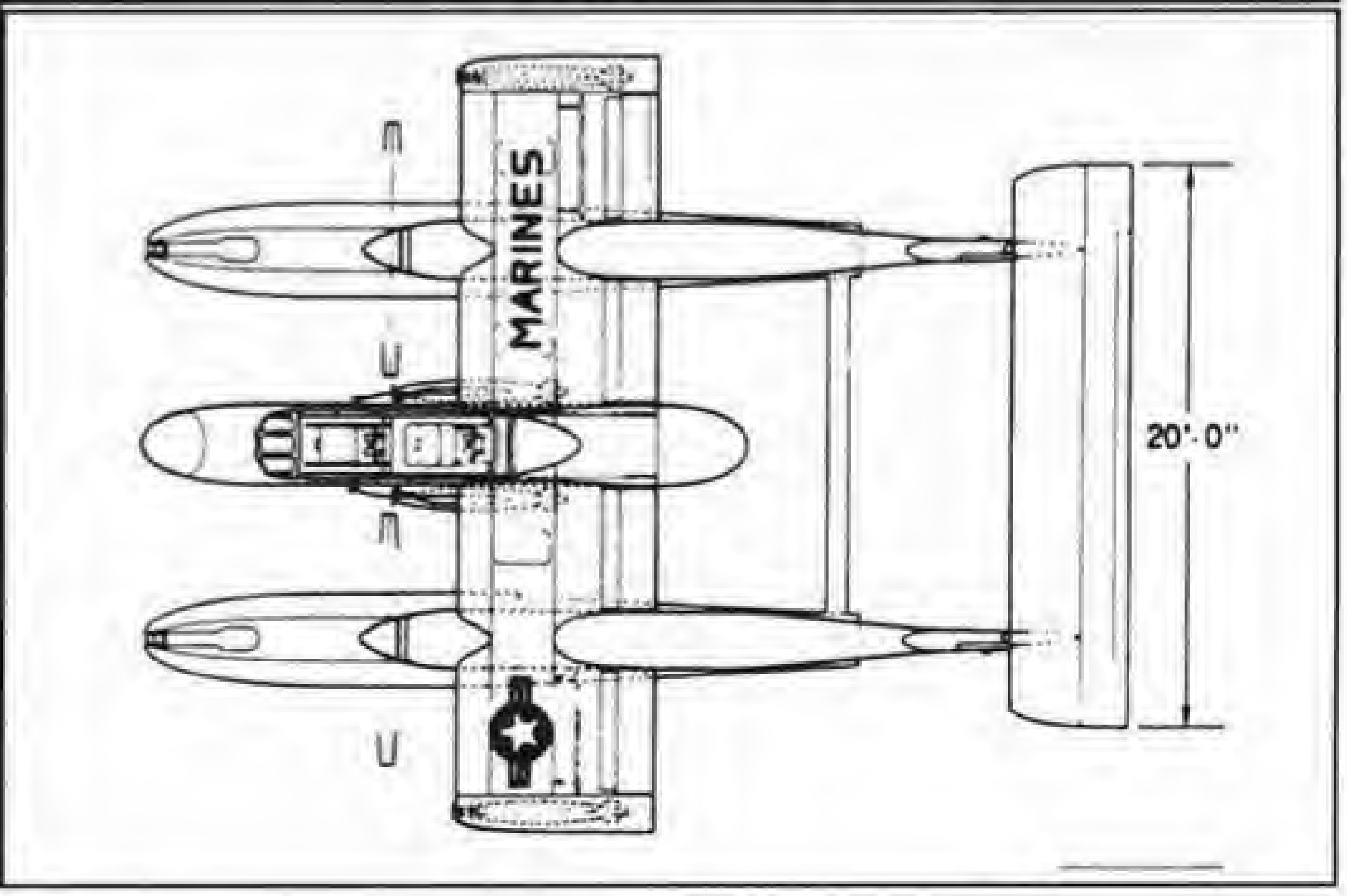
AMPHIBIOUS KIT CONVERSION

The original Navy RFP called for an amphibious kit so that the Charger would be capable of operating from the numerous water locations in areas such as South East Asia. A 1/7th scale, dynamic model was constructed and a comprehensive series of tests was conducted in the Convair Towing Basin to verify the engineering predictions and to establish a high level of confidence in the anticipated operating characteristics.

The floats were to be provided in kit form, and were designed to be readily installed on the airplane with minimum modification, while retaining the basic armament loading and operational characteristics. The floats were to be mounted on the existing main landing gear struts in place of the wheels. Adapters on the floats attach to the axles of the gear. The landing gear cylinders would be bottomed by relieving the strut pressure and attaching a solid link in lieu of the torque link (scissors).







MODEL 48 CHARGER ARMAMENT

ARMAMENT CHARACTERISTICS

The basic armament provisions of the Convair Model 48 were five external pylon stations and two internal store stations. The center fuselage station and the wingtip stations each could carry up to 600 pounds of stores. The two side fuselage stations could carry stores up to 1,200 pounds each. All pylons were designed for a flight load factor of 8Gs. The bomb and gunsight was a simple (non-computing) optical system for weapons delivery of a type similar to that used on the A4D Skyhawk.

STORES ALIGNMENT

All external (pylon mounted) stores were aligned in a pitch-up attitude of 3° 30' to the waterline plane. The fixed gun alignment was also set at 3° 30'. Internal stores alignment was established on the waterline plane since pitching effects are considered negligible for airdrops from within the utility bay area.

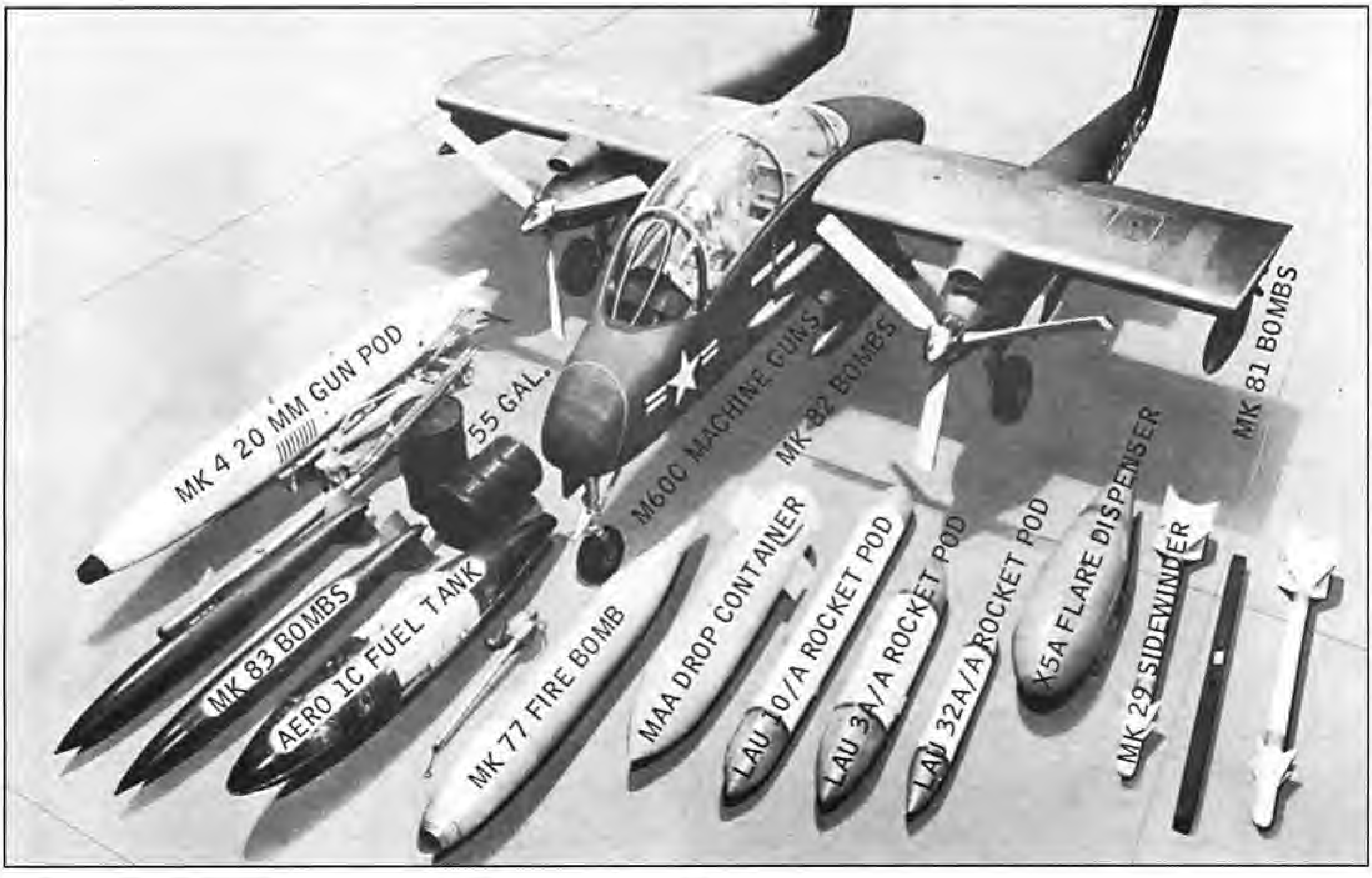
ARMAMENT CONTROLS

The armament selection, station selection, and mode selection controls were to be located on the left side of the pilot's instrument panel. The master armament power control switch was to be located in the upper left corner of the pilot's instrument panel. The emergency jettison control was located in the lower left corner of the panel.These controls, along with the utility door "open" indicator and the landing gear position indicators, were within the peripheral vision of the pilot and readily accessible during all flight maneuvers. Electro-mechanical interlocks prevented inadvertent operation during flight or during maintenance.

FIXED GUNS AND PODS

Separate, dual 7.62mm fixed gun packages were to be mounted on each side of the fuselage. The fixed gun packs were to be attached to the outside of the fuselage to provide ease of removal and maintenance, and to facilitate service for the guns, ammunition and fairing structure. "Mail slot" service through the sides of the fuselage feeds ammunition to all four guns simultaneously, from a central controlled environment within the fuselage, adjacent to the gun mounts. Quick turn-around time was possible by exchanging completely loaded ammunition boxes through the utility bay door. Loaded ammunition boxes can be fed into place while in flight. Manual gun recharging handles were provided at each side, adjacent to the pilot's seat arm rest on the top of the console.

Provisions for the installation and operation of the Mk 4-20mm gun pod was available on both external side fuselage pylons. The structural rigidity of the fuselage pylon-mounted gun pods enhanced the accuracy of this weapon and reduced the bore-sight maintenance usually associated with externally installed heavy guns.



At left, possible armament choices lined up in front of the charger mock-up. (via Jim Fink) Below, late in the test program, Howie Auten poses with the modified Charger and its intended weapons load. The light areas are painted da-glo red. (via SDAM)

Above, mock-up with a LAU3A rocket pod on the fuselage pylon and a LAU10/A rocket pod on the wingtip pylon. (via SDAM) Above right, the mock-up of an MAA Drop Container on the wingtip pylon and Mk82 bombs on the fuselage pylons. At right, the X5A Flare Dispenser on the wingtip pylon. (via Jim Fink)

MISSION GROSS WEIGHT

ARMED RECONNAISSANCE MISSION	7,100lb.
CLOSE AIR SUPPORT MISSION	8,350lb.
VISUAL RECONNAISSANCE MISSION	6,262lb.
FERRY MISSION	10,460lb.

ARMAMENT INSTALLATION

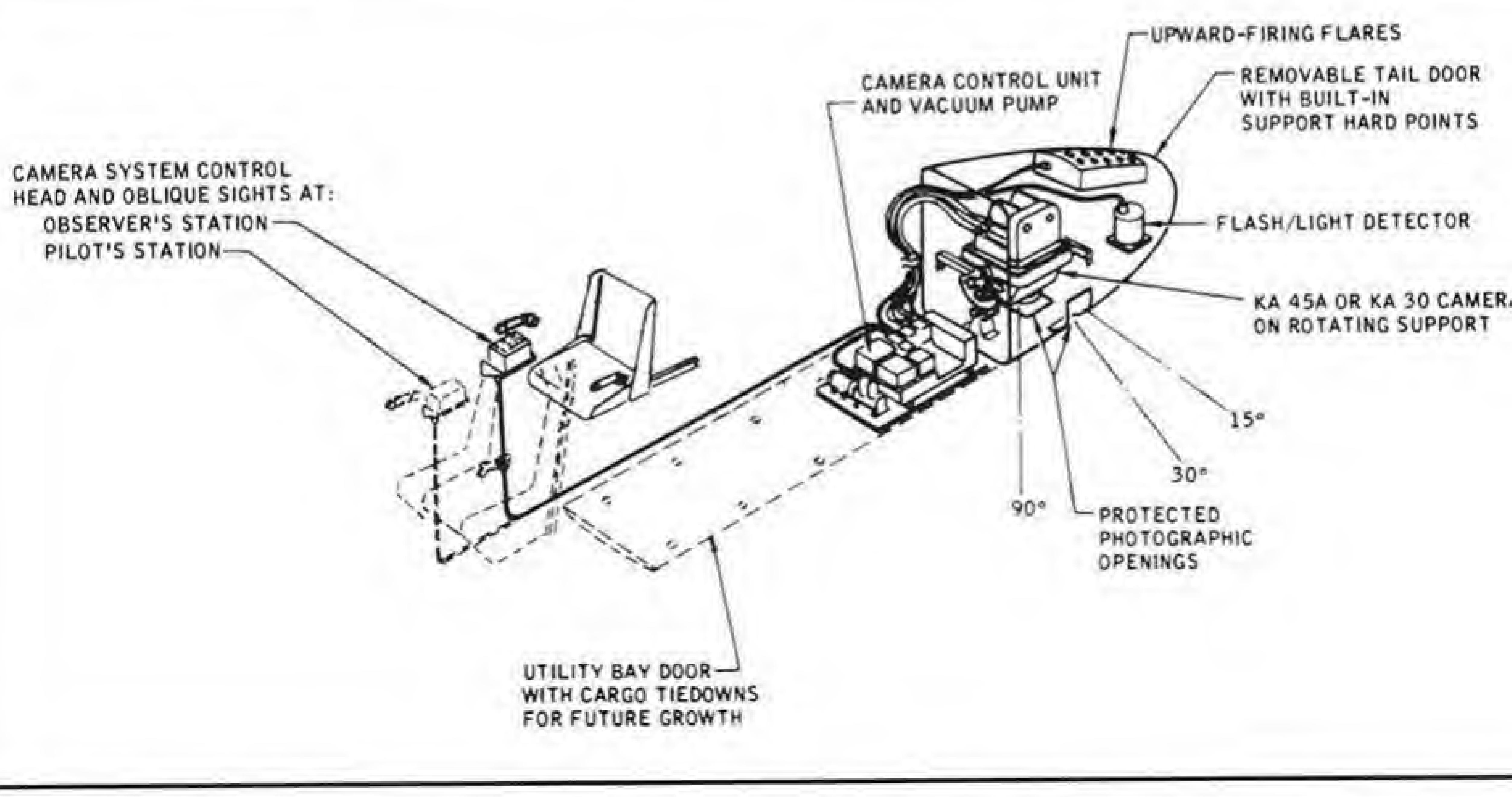
ARMED RECONNAISSANCE MISSION 1,217lb. external ordnance

Wingtip Stations			**590**	
Two Mk 81 bombs		**540**		
Two pylons and racks		**50**		
SIDE FUSELAGE STATIONS			**627**	
Two Mk 81 bombs		**540**		
Two pylons and racks		**87**		
USEFUL LOAD				**2,643**
Crew (1)			**200**	
Fuel	**180 gal.**	**1,185**		
Oil	**3 gal.**	**34**		

CLOSE AIR SUPPORT MISSION 2,510lb. external ordnance

Wingtip Stations			1,104	
Two Mk 82 bombs		1,050		
Two pylons and racks		54		
FIXED GUNS				265
Four M60C 7.62mm			95	
500 rounds ammunition per gun			120	
Fairings, gunsight, etc.			50	
USEFUL LOAD				3,893
Crew (2)			400	
Fuel	134 gal.	870		
Oil	3 gal.	34		
VISUAL RECONNAISSANCE MISSION				
Crew (2)			400	
Fuel	199 gal.		1,302	
Oil	3 gal.		34	
FERRY MISSION crew (1)				
Fuel	808 gal.		5,269	
Oil	3 gal.		34	

PHOTOGRAPHIC RECONNAISSANCE KIT



LOADING

A salient feature of the Model 48 aircraft was the ease and rapidity with which armament could be loaded. At the main base, this would be accomplished in less than 15 minutes using Mk 6 hydraulic hoists as seen below. In the forward area, lightweight, manually actuated Mk 8 bomb hoists could be used to load or unload cargo and armament as seen at right.

At far left, Aero 1C fuel tank loaded on the fuselage pylon of the Charger mock-up. The mock-up fuselage gun pod configuration was not used. (via SDAM)

At left top, an X5A Flare dispenser mounted on the fuselage weapons pylon of the Charger mock-up. (via Jim Fink)

At left middle, a Mk 77 Fire Bomb mounted on the right fuselage weapons pylon on the Model 48 Charger mock-up. (via Jim Fink)

"It was obvious from the start that we were trying to make the aircraft do too much. Because of the compact design requirements, the wing span was extremely short and thus provided control problems. Eventually, we extended it another another 2' 7", but we never had a wing as long as that finally installed on the North American OV-10 Bronco. We knew we would have to do something radical to be able to get the aircraft in and out of the small areas required by the contract. That's how we came up with that aerodynamic flying "SLAB" on the tail, which ended up being overly sensitive. Even up to the day before I first flew it, I wasn't sure I could fly it. During taxi testing it was evident that it was "so-sensitive" and light on longitudinal and lateral forces.

The way I flew it on the first flight was to bury my right elbow into my knee and stomach and then fly the thing with my fingertips on the longitudinal control in an attempt to not overcontrol the aircraft. When I took off, I found the aircraft was more docile than I had expected as long as I was careful. The aircraft had heavy lateral forces and tended to roll to the left constantly, so I had to be careful. I took it for a short evaluation flight ending with a landing at North Island.

Because Lindberg Field was a heavy traffic commercial field, the FAA would only allow us to takeoff from it on a first flight. We had to land at another field and then certify the aircraft airworthy before the FAA would allow us to conduct test flights out of Lindberg. After signing the FAA's certification form, I took back off and landed at Lindberg, where we were able to tell the world we had flown the world's first "coin" aircraft.

Once back at Lindberg, it was back into the shop and a huddle with the aerodynamicists to come up with improvements in the longitudinal control. Initially, we changed the gearing on the flight damping to de-sensitize the controls, but further changes would be needed. (see Howie Auten's comments)

We had a hell of a time worrying about proper pitching up to clear a 50 foot obstacle in under 500 feet. Our worry was that we might strike the booms hard on the runway during this pitch-up. This never did happen, however I did do some taxi testing where I dragged the booms while testing the corrected control surfaces.

I did have a landing incident one day while doing touch-and-goes. During one of the practice landings, I lowered the gear and received three green indicators. I made a normal landing and upon lowering the nose, the nose gear slowly retracted. I immediately chopped the power and the aircraft settled onto its nose.

The mishap occurred because one of the links had broken on the nose gear and unfortunately that's where the downlock indicator was located. Therefore I had no warning that the gear was unsafe. When we repaired the aircraft we modified it by putting a little plexiglass window in the floor for the pilot to visually check his nose gear.

Had I known of the failed nose gear, I would have kept the weight off the nose gear until I was almost completely stopped due to the strong longitudinal control available to me. With the proper usage of the PT6A engines and the brakes, I might have been able to even keep the nose up long enough for the ground crew to prop up the nose.

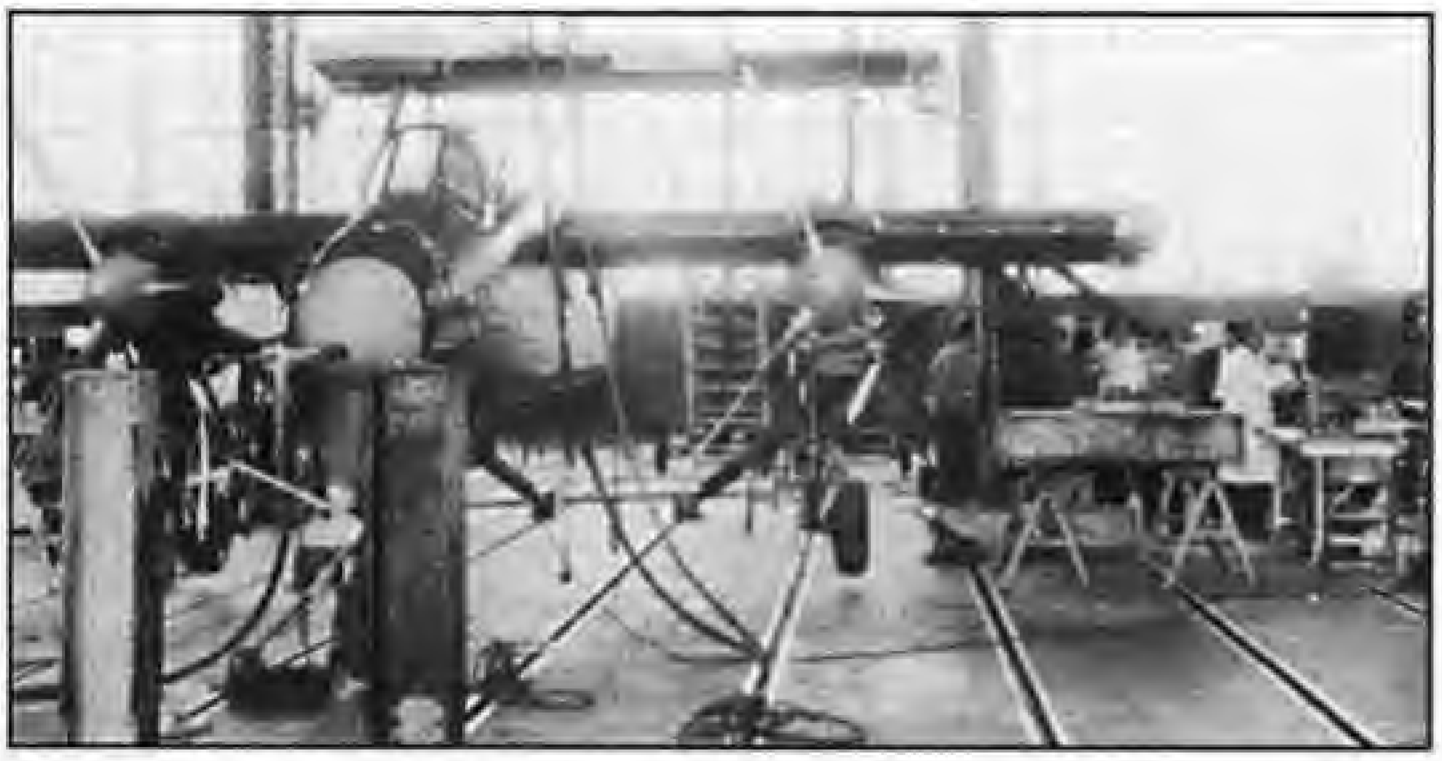
On one flight, I experienced an engine failure which allowed me to test the single engine landing properties of the Charger. The engine out was caused by a simple maintenance error. The shaft that went into the fuel control unit was not safety wired and normal engine vibration caused the retaining nut to walk off, whereupon the fuel flow was cut off by a spring loaded valve. When the valve slammed shut, I lost the engine. It happened at about 3,000 feet of altitude out in the canyons back of San Diego State. The landing was easy and uneventful, as I had done quite a

Above, Johnny Knebel. (via Johnny Knebel)

bit of single engine work. Since there was no direct mechanical connection between the propeller gear box and the gas turbine, you just feathered the engine and kept the engine running.

I made a second engine out landing on 7 August 1965, when the left hand engine started losing temp and torque, and I feathered the engine and landed with 20° flaps. The single engine landing was accomplished with no difficulty at just over 90 knots indicated air speed with moderate power on the right engine. Power was chopped prior to the flare and the ensuing touchdown was followed by the slight lunging of the struts.

When the Charger program started, I was Convair's only test pilot. Howie Auten was later brought out from General Dynamics, Ft. Worth, to help me out and eventually he took over the program. After checking out Howie on the Charger we almost lost the aircraft during a flutter test he was conducting. The left boom cracked and was barely held on by the skin and a longeron. I was flying chase with Bill Martin in the company's Aero Commander and pulled in close to do a visual inspection. Our inspection did not show us how serious the problem was, so we instructed Howie to go



Vibration tests conducted as part of the flutter-free analysis confirmed theoretical vibration analysis of the Charger structure, and a final weighing before the flight confirmed achievement of Convair's intensive weight-control efforts that brought the prototype Charger to completion below the weight figure guaranteed in the LARA proposal. Static evaluation of the lateral control system was made in connection with engine runups and instrument calibrations. Crosswinds were simulated by the backwash from an Aero Commander, allowing Hamilton-Standard engineers to determine vibratory stresses on the propellers at different speeds and pitch angles.

Below, Johnny Knebel returns from a ground taxi test prior to the Charger's first flight. Note tube-steel nose-wheel fork.

Above, Johnny Knebel braking at Lindberg Field after making a high speed taxi run. (SDAM)

ahead and land the Charger. If we had known how badly the boom was damaged, I would have told Howie to eject.

After the airplane landed, we learned that aerodynamic forces in flight had held the two boom halves tight along the seam of the crack and we couldn't see how bad the damage was. On the ground, it was evident that we had been in real danger of losing the aircraft. During the ensuing repairs we strengthened the boom structure and improved directional stability by adding dorsal and ventral fins."

EXCERPTS FROM SUMMARY OF PILOT'S COMMENTS THROUGH FLIGHT 27, BY JOHNNY KNEBEL

(flights 3-27 were conducted from 3-20 December 1964 prior to installation of opposite rotating propellers)

GENERAL

"Ground handling on a paved surface is easily accomplished with brakes only; brake pedal throw is satisfactory and visibility is good.

TRIM TABS

Lateral trim tabs on the inboard ailerons provide adequate lateral trim over the airspeed range flown. Directional trim and longitudinal trim were satisfactory for the speed range and configurations flown.

Below, Johnny Knebel on his take-off roll on 25 November 1964 during the Charger's first flight. (SDAM)

FLIGHT CONTROLS

The spoilers exhibit positive stick position and forces, but forces are slightly higher than desirable. The rudder provides positive position and forces. No rudder float or lock was noted while evaluating thrust asymmetry. The rudder was effective at 20 to 25 KIAS during takeoff.

STATIC LONGITUDINAL STABILITY

Stability was evaluated with flaps

Above, Johnny Knebel on the ground with the Charger at NAS North Island on 25 November 1964, where he certified the aircraft airworthy for the FAA. Initially, the Charger was equipped with propeller gearboxes that rotated in the same direction. Prop spinners were natural metal. (SDAM)

Above and below, the Charger is seen returning to Lindberg Field after its first flight. The landing gear remained down throughout the first flight. At right, Johnny Knebel exits the Charger after completing the first flight. (SDAM)

0°/0°, landing gear up; flaps 20°/0°, landing gear down; and flaps 60°/30°, landing gear down. Kreuger flaps were retracted. Static longitudinal stability is characterized by a shallow stick force and position gradient with low forces at speeds below trim speed of 100KIAS, and by shallow gradient stick position with moderate forces at speeds greater than trim. Friction speed was determined to be +/- 2KIAS at 100 KIAS, 8,000 ft., with flaps and landing gear retracted.

NORMAL STALLS

Normal stalls were investigated at 0°/0°, 20°/0°, 40°/11°, and 60°/30° flap settings with landing gear up and down. Power varied from flight idle to power for level flight. The stalls were entered from trim of 100 KIAS at 10,000 ft.

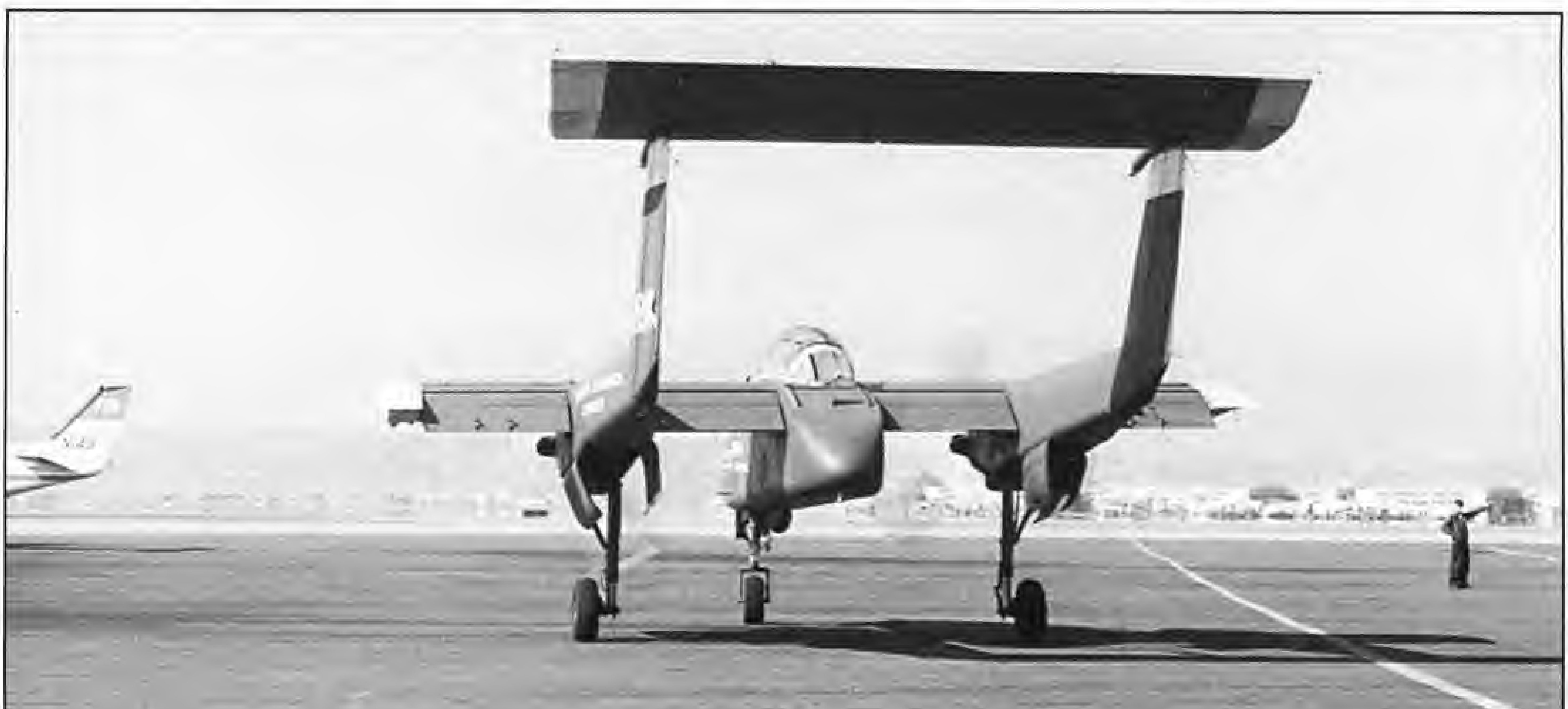
Stalls in the 0°/0° flap configuration with power off or at flight idle are characterized by little, if any, buffet; when present, buffet onset is within 2 KIAS of the stall. The left wing drop was followed immediately by the nose pitching down. Rudders and elevators were effective throughout the stall. The elevator was effective in stall recovery. The conventional stall recovery technique (stick forward) proved satisfactory for recovery.

Sink rate in the idle power, flaps and gear extended configuration is as high as 5,000 fpm. Stalls in the 0°/0° flap configuration occurred at 80 to 82 KIAS and diminished to 60 to 65 KIAS at idle power. Stalls with flaps extended and at power for level flight do not

Above, Johnny Knebel drags the tail booms during pitch-up taxi tests. These tests were conducted to ascertain the maximum pitch-up angle available to the Charger so that it could clear a 50 foot obstacle in less than 500 feet. (SDAM)

At right, two routine taxi views of the Charger early in the test program at Lindberg Field. (SDAM)

Below, the obvious too short wing span of the Charger is evident in this aft taxi view. Note the shape of the original fuselage tail cone. (SDAM)

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have the characteristic left wing roll of the 0°/0° flaps, idle power configuration. The characteristic is for the nose to drop with wings nearly level. Elevator, rudder and spoiler were effective to 50 KIAS.

ACCELERATED STALLS

Accelerated stalls with 0°/0° flaps are characterized by buffet warning about 0.2g before the stall occurs. Stalls occurred 1.8 to 1.9g, 120 KIAS, left turn at 7,500 ft.; and 2.0g, 120 KIAS, right turn at 8,000 ft. Stick forces were light and stick position positive. The elevator was effective for immediate stall recovery and no rolling or yawing was noted at stall. During stalls at 150 kt., 3.0g in left and right turns at 8,000 ft., no rolling or yawing was noted; pitchdown with buffet occurred and the elevator was effective in recovery.

MANEUVERING STABILITY

Maneuvering stability was investigated at 7,000 to 8,000 ft., 120 and 150

At left, Johnny Knebel brings the Charger in for a landing at Lindberg Field in its original configuration. (SDAM)

Bottom, Charger comes to a full-stop after a short field landing test. (SDAM)

At right, hi-speed taxi runs at Lindberg. (via Jim Fink)

KIAS in left and right turns of 1.5, 2.0, 2.5 and 3.0g. Stick forces and stick position were light and positive with a shallow gradient.

LATERAL CONTROL EFFECTIVENESS

Bank-to-bank turns were investigated from 60° to 60° and 45° to 45° with rudders fixed and coordinated. Coordinated turns are characterized by small rudder requirements at the start of the turn through 15° to 20° of opposite bank, at which point a rapid and larger rudder deflection is required. Full spoiler deflection turns with coordinated rudder are easily accomplished.

SIDESLIPS

Wings-level sideslips are easily accomplished with positive rudder force and position, and with positive spoiler force and position. Full lateral control is reached with the rudder at 7/8 to full.

LANDING

Landings were completed in the 20°/0° and 40°/11° flap configurations with and without Kreuger flaps extended. Control appeared to be best at 40°/11° flaps, Kreuger flaps extended without the ailerons connected. With the inboard ailerons connected, extending the Kreugers caused mild lateral stick buffeting. Touchdown speeds were about 70 to 80 KIAS and sink rates up to 600 fpm with power at 20 to 25 lb. torque. Although 2.0g was recorded on the cockpit accelerometer, the airplane did not bounce back off the runway. Elevator and rudder control were effective throughout the landing.

Above, the VAT-69 crew that originally created the Charger in building 69. Johnny Knebel is kneeling fourth from the right. (via Johnny Knebel) Below, the Charger was chained down and covered by a cargo net for protection during static ejection seat tests. The tests proved that the A-4 style ejection seats were capable of firing the crew successfully through the Chargers plexiglass canopy to a suitable height for the safe opening of the parachute canopy. (SDAM) At right, three-early flight photos. Pilot's visibility was excellent. Note unique partially buried nose gear in the fully retracted position. (SDAM)


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HOWIE AUTEN REMEMBERS THE CHARGER PROGRAM

BY HOWIE AUTEN

"When the program started, Johnny was the only pilot flying flights 1-9, I flew 10-26 and Johnny flew the 27th. By the time the program had finished, Johnny had moved on and I ended up flying the majority of the test program. Early in the program, John and I would trade off between flying the Charger and flying the chase plane, an Aero Commander.

"We painted the Blaze Orange on the aircraft because we discovered that the overall green Charger couldn't be seen when flying low and slow down in the weeds! You would just lose it in the ground clutter once you were more than 100 yards from it. Even with the Blaze Orange, if you were a mile away you would lose sight of the Charger. It was unbelievable how that bird blended in with the countryside.

"It was a funny machine. At low speed we didn't have enough drag, at high speed we had too much drag.This was mainly due to the constant thickness, constant chord (constant-constant-constant-constant everything) wing and tail. The follow-on design would have easily fixed these problems with a different wing with taper and thickness changes that would eliminate the constant chord. These changes, along with the addition of big tail boom farings, would correct the problem.

"The short span didn't give us a lot of surface area, but did give us a lot of wing-wash, and this, coupled with the draggy booms, gave us a severe performance penalty. Stan Piskan was trying to solve the problem on the prototype, but of course could not alter the wing design and was limited to wingtip changes. He finally got mad after trying dozens of wing tip designs. He said, 'I'll just start at the tip-chord and bring it up 45° to where it intersects the upper wing and that's it.' This fix did the trick and the drag reduction it generated increased our top speed by 40 knots and added another 2'7" to the span.

"The elevator was supercritical when we first started out. We had a full-span tab on the "Flying Tail" which, because of its size was extremely sensitive. If you barely flicked the stick you would pitch up and down violently. What we did was cut the tab down to 80% of the span, and that worked well. Bob Pfferman worked on the problem from the angle of the bob-weights for 2 to 3 months with his slide rule. After deciding the correct size and weight, they sent the problem out to the large computers at Pomona where, after another 6

Below, the huge size of the "Flying Slab" horizontal control surface and its full-span trim tab are evident in this photo. The tab was reduced to 80% of the span as the primary fix to reduce the over-sensitivity of the elevator. Note the elevator balances, the empty second cockpit, the canopy retracting rails on the upper fuselage, and the slightly open spoiler on the right wing. This spoiler was always slightly open due to what was believed to be a slightly warped wing. (SDAM)

months, it was concluded that Bob was right, give or take a pound.

"We were also wrestling the lateral control problems. The circular arc spoilers just were not the way to go. They were a holdover from the B-46 days. The system was unstable and both spoilers would bounce up and down together. Not only were they a bad idea, they were installed wrong, being located too far aft on the wing. The spoilers should have been installed at the Max thickness point of the wings. What we needed was a flat plate spoiler with a bit of boost on it like on a T-33.

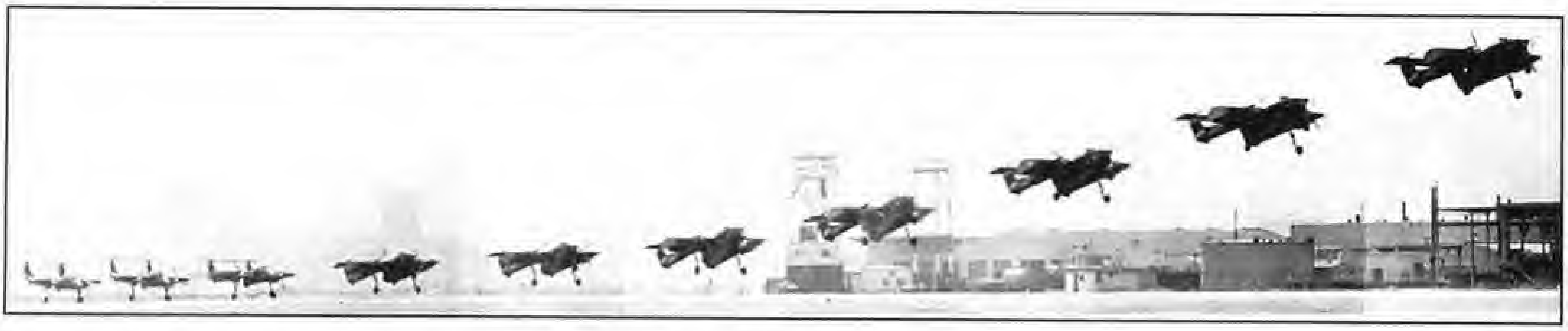
"During testing, we would crank the spoilers up 60° and nothing would happen, but boy did you have nice lateral control. It only affected lateral control, the spoilers had no effect on rate of climb or on speed either. For some reason, the right spoiler was always up a little no matter what you did or what direction the props turned. We finally concluded the wing must have been slightly warped.

"The aftward angled windscreen / canopy line was not designed as such, but occurred when the fellow laying out the ejection seat path had drawn the toe ejection line on the blueprints. Then somebody laying out the windscreen took that line as the canopy line, and nobody caught it until after assembly. As it turned out, it aided in getting in and out of the aircraft and really didn't make any difference. On several occasions, I flew the aircraft on final approach with the canopy rolled back to see how windy and noisy it would get. At 40 knots on final I had no wind at all in the cockpit.

"McNamara's procurement processes and the Navy's investment in developing the Garrett Turboprop engines ensured that North American Aviation would win the contract, as the aircraft was to be designed around these engines. The Navy had to have an aircraft program to justify the money already spent on the Garrett engines. Even with all the money that had been spent on the engines, they still had nothing but problems with them during the Bronco's development. They burned up six engines during ground installation and build up prior to making their first flight, whereas we used the same two engines throughout the Charger program. We were somewhat of an embarrassment to the Navy with our flying prototype. We were able to meet all the Navy Specs with our aircraft prior to the first flight of the OV-10. The first requirement of the RFP was to demonstrate a takeoff over a 50 ft. obstacle in under 500. The Charger could do it but the Bronco could not so, North American with the Navy's permission reversed the RFP and put the high dive speed requirement first instead of last.

"We started out the program with 550 shaft hp. on each engine. After 10 to 25 hours of flight time we would ship the motors to Canada, where they inspected them then turned the wick up and returned them. They never found any wear in the engines, so they kept increasing the temp and we ended up with some 750 shaft hp. at the end of the program. We used the same engines for the whole program. After Pratt & Whitney made us a gear box that would go the opposite

Below, early test flight over San Diego, California. (SDAM)



direction, we were able to experiment with different prop rotation combinations. We swapped it around to see where we could get the lowest speed. We found prop tips down toward the wingtips gave us the lowest speed. I could just hang there at 25 knots. Anything lower than that and your elevator control, stick position, and forces were reversed.

"We also worked on what we called 'thrust erasers' for the engines. If your nose was high and you lost a engine, the good one would drop (for example) to 50%, preventing you from rolling into the good engine. It worked well and you would hardly even yaw. The nose would drop about 5° below the horizon, making it easy to recover by controlling the rudder as you added power to the good engine. The system worked so well that I wish it were used on current small twin-engined aircraft. It was a simple system based on loss of oil pressure. When an engine failed you'd get ZERO pressure, and the erasers would kick in.

The most troubling aspect of the prototype was its noise level. At takeoff you would be subjected to 137DB; which was 5DB greater than that of an F-106 in full afterburner being measured on takeoff from 25 feet off the runway. The props just beat the sound off the slab-sided fuselage of the prototype. We had two radios in the Charger, and it would trash both of them on every high performance takeoff. Finally, we said, 'wait a minute. Do we really need 2,200 RPM?' So we tried 2,000 RPM and almost all of the cockpit noise went away. This problem would have been fixed in the next version by using slightly curved sides and the addition of more internal structure. However, we found that the reduction in RPMs did not diminish our takeoff performance at all.

"Johnny Knebel had an engine-out situation where he landed the aircraft on one engine. I, too, had a couple of engine outs for various reasons, but I had already flown the Charger on one engine to 20,000 feet and had flown it at 200 feet above sea level at a speed of 30 knots. During one test, I had the left engine running and had 5° of wing down and I was able to hold altitude, but was making a yaw turn to the right. I let it go for about 180° and then cranked up the other engine and returned to normal flight.

I almost lost the Charger one day while doing flutter tests. I had completed tests at 320 knots and was attempting a test at 325 knots. This was not a significant speed, as we had been there before. At about 220 knots, the rudders started to flutter

Above, time lapse photo documents the Charger's ability to clear a 50 foot obstacle in under 500 feet. (via Jim Fink)

Below, the squared-off original short wingtips are evident in this photo along with the troublesome right spoiler. (SDAM)

Above, time lapse photo documents typical short field landing capabilities. On the concrete runway, Howie Auten was able to stop the Charger in about two wheel base lengths by locking up the brakes at about 50 feet and then pushing the throttles into about 60% reverse thrust at 10 feet of altitude and then letting it hit. He'd get out and find two big shiny spots on the main tires where they slid. (via Jim Fink)

and beat all over the place. The horizontal tail was oil-canning in numerous places, and was dammed-near broken in two. When the rudders got to flapping, they broke the boom right behind the aft wheel well opening. The boom cracked all the way around to within 1.5 inches of the upper "T" stringer along the spine. I knew something was wrong because the stick just wouldn't respond, it was nothing but slop. I told John 'I need you to follow me in, I'm going to give up!' He pulled up alongside and said everything looked good. I told the guys on the ground to save that paper, I think I'm going to need it! I was trying to alert the ground crew of a possible problem, but nobody was getting the message. I couldn't just come out and say what I thought was wrong, because I was on 123.5 where everyone could listen in. I went out over the ocean and came in to land on runway #9. When I put the gear down, the battery fell out and was hanging by its cable. During landing roll-out the tower called and said, '28 KILO, you have a battery hanging out following you down the runway.' When I got out, I saw the battery hanging down about a foot off the runway and I could see the crack going completely around the boom. The stringer along the upper spine of the boom was all that was holding the boom together. We didn't tell anyone about the incident for a long time. That's when we modified the prototype with the new wingtips, and we strengthened the booms with ventral and dorsal fairings.

The flaps were capable of 110° deflection, but we settled on a maximum of 90° because you didn't gain

Below, photo of damage to boom experienced during flutter testing. Knowledge of the damage was kept to the VAT-69 team until after the program was cancelled with the loss of the prototype. (SDAM)

At right, Charger banks away from chase plane. (SDAM)

prior to their first test flights. I wanted them to run up one engine then the other one, then both with various flap settings as this airplane responded like no other aircraft ever made. It was somewhere between a plane and a helicopter. Jim Read the Marine didn't want anything to do with it nor did the Navy representative LCDR Harden, but Don Wray the Army pilot and Joe Storface the Air Force pilot gave it a try after watching Read's first flight. During Jim Read's first flight, he just about wrapped up the aircraft. For their indoctrination, we chained it down by the blast fence. When you ran up the power with full takeoff flaps, it would lift off the ground while pitching forward as it had a tremendous amount of lift.

Above, the modified Charger taxis out for a test flight. Notice the reshaped tail cone. (SDAM)

Below, final maintenance checks being performed on the modified Charger prior to reentering the test program. Note the 80% slab trim tab. (via Jim Fink)

anything after that. If you put down takeoff flaps and then ran up the power, the aircraft would just start lifting up and getting light on the gear. Because of this unique feature, my plan was to strap the aircraft down and make four DOD representatives experience the lift-off phenomena

On flight 196; LCDR Dave Harden lost the aircraft and killed the program. We had told Harden and the other service pilots that if you ever have an engine out, just come on in and land it, don't try to go around. Harden's first problem was he shut

the engine down using the wrong procedure, causing the bearings to seize in the gear drive. When he went to start it again he got the turbine running, but couldn't get the prop to turn. He called Convair's tower and said he couldn't unfeather the prop. WHAT? The guys in the tower said, 'what do you mean?' The tower crew looked at the test card and said, 'your not supposed to be shutting down an engine!' 'Leave it alone and come on in and land.' As Harden comes in to land -- he's over the runway, and instead of putting it down, he decided to go around. He slammed on the power, and when the good right engine grabbed, he yawed and rolled. I can

Above and below, Howie Auten conducts takeoff and landing tests with tufting on the canopy after the modifications were made. Note the small dorsal fin added to the rear of the fuselage. (SDAM)

still hear the engine rev up, and then as he yanked the power off, the sick-

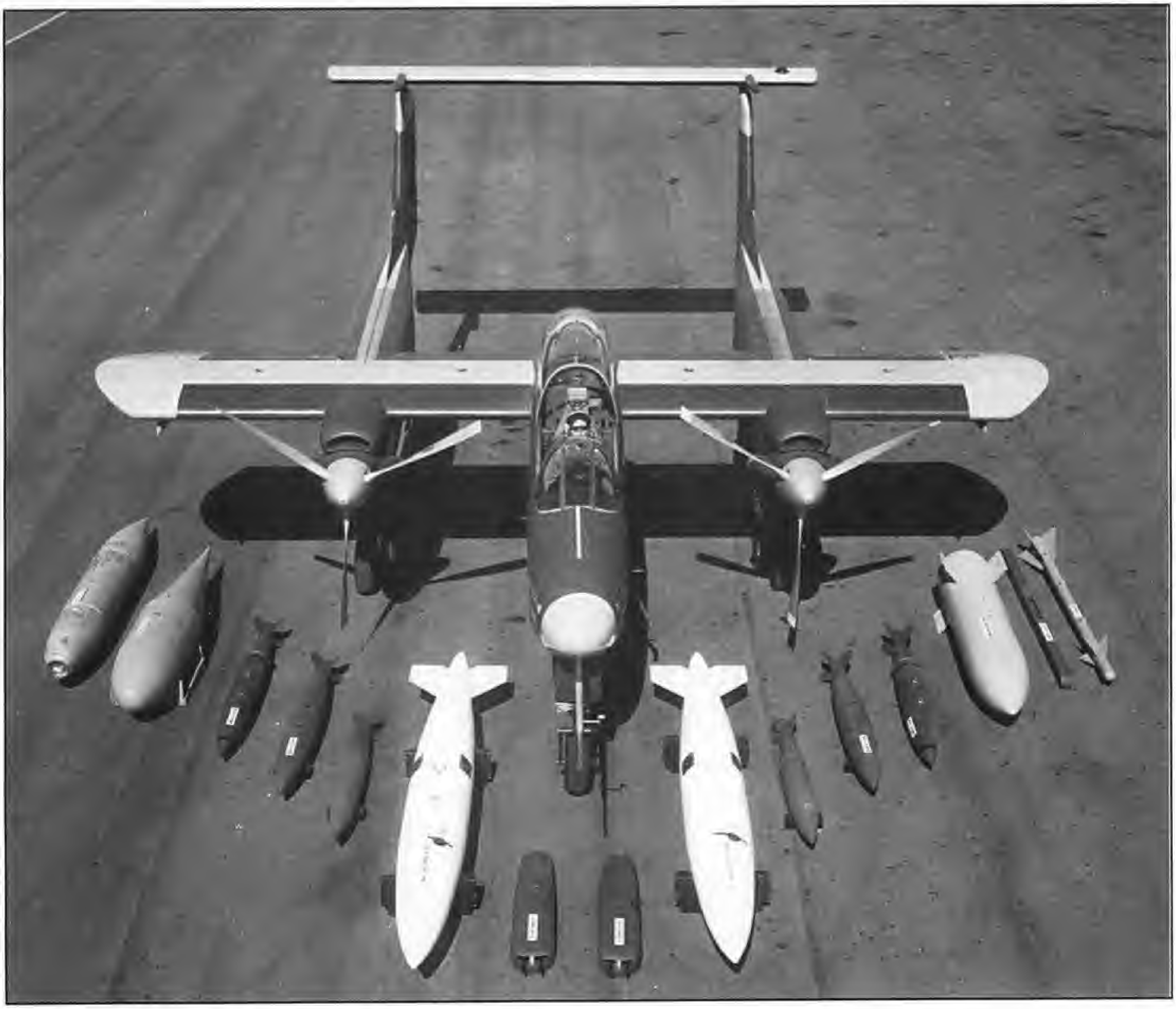
ening quiet as he straightened out. But he was too slow and he shoved the power on and then yanked it off again. He repeated this cycle a third time and was heading straight for the tower when he punched out. He landed safely on Ryan's roof above the latrine and the aircraft went in upside down against the Ryan fence, where all the metal burnt down to the level of the fuel.

Harden just about lost his right foot when he went out. We had a piece of angle iron under the right instrument panel. He had on full right rudder when he punched out, so his foot got caught on the angle iron and he almost lost it at the arch.

If Harden hadn't crashed it, we would have taken the Charger out to San Clemente Island to conduct weapons tests on a simulated Viet Nam village. The Marines at Camp Pendleton had given us a flame thrower like those used on tanks, 7.62 mini-guns, armament panels, and other armaments not usually found on aircraft for the tests. One of the ideas I wanted to test was the installation of a flame thrower in a slightly down forward or rearward angle. You could then just fly over a target and just squirt it along your flight path, you wouldn't even have to aim. I wanted to install three sets of guns with a 3-position switch that would allow me to fire them forward, fire them down and fire them aft. You wouldn't have to aim, you just needed to put a lot of lead out.

Back in Washington, DC, we had been passing out our promotion COIN Charger coins everywhere, and were carpeting the city with our Charger zappers. We even put them

Below, Howie Auten sits in the modified Charger for a publicity shot of the aircraft and some of its possible weapon loads. Note the distinctive shape of the new wingtips, and the additional "Blaze" orange areas. The upper wing stripes, ventral boom stripes and the entire forward portion of the slab orange was what was added. The propellers and spinners remained silver. (NASM)



Above, the modified Charger with canopy tufting and a wingtip instrument test boom is seen during slow flight tests. (SDAM)

on the Russian embassy, and they weren't too happy with us and bitched quite a bit about it to our State Department."

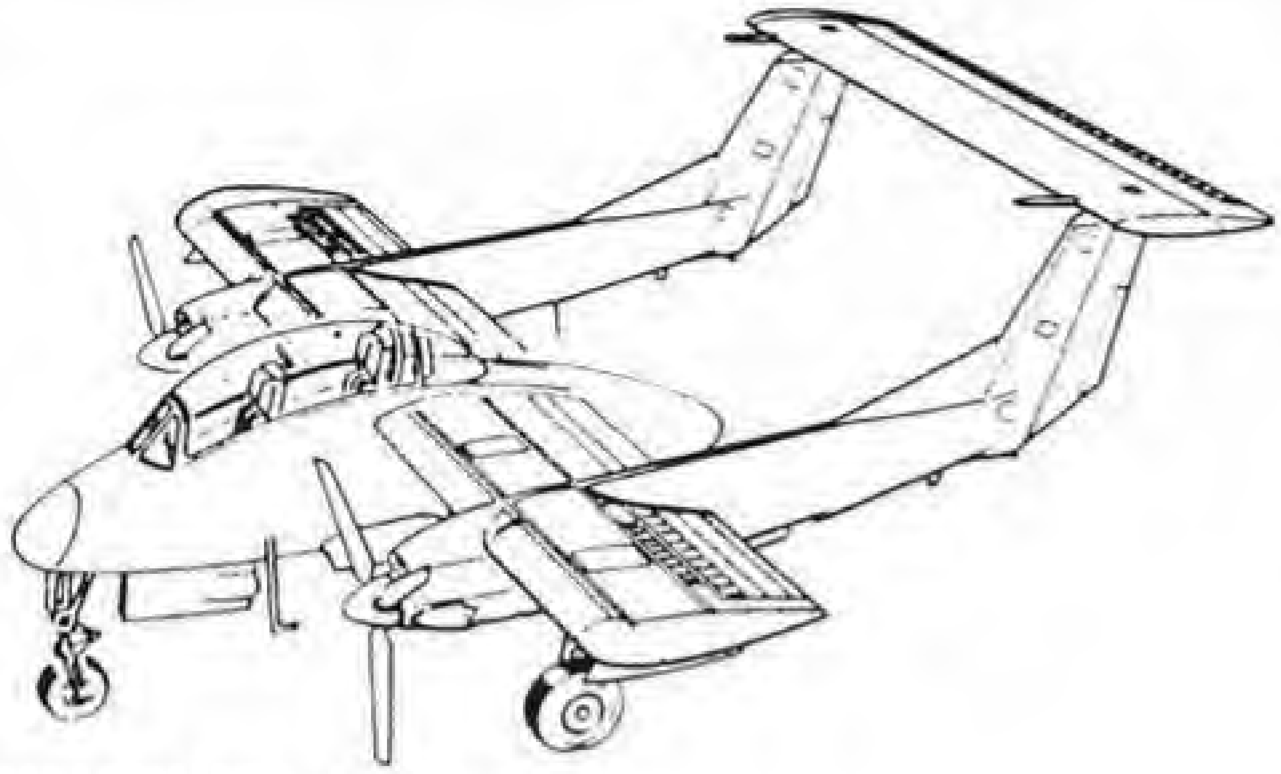
FLIGHT TEST SUMMARY

Prior to the Preliminary Joint Service Flight Evaluation Program, the Charger had flown a total of 161 flights for 157 hours 46 minutes, including the NASA/Ames 10-hour STOL program. After returning from Ames, the aircraft entered two weeks of maintenance followed by 14 test flights. On 7 October, Capt Jim Read started the service testing with flight 176. Read flew 5 flights for 6 hours 11 minutes, Capt Stroface, USAF, flew 4 flights for 4 hours 48 minutes, Capt Wray, USA, flew 4 flights for 4 hours 39 minutes, and LCDR Harden, USN, flew 5 flights for 5 hours 57 minutes, which culminated in his crash of the prototype during flight 196 (Joint Service Flight 18) on 19 October 1965. During the service tests, Convair pilots flew 3 flights including n engine shutdown and restart at 20,000 feet.

Below, the opposite side of the COIN coin bears the sales slogan A BIRD IN HAND as the Charger was flying and the Bronco was not. (via Jim Fink)

Below, side view of the modified Charger and its new paint scheme. Note position of canopy, which could be pulled back further to allow access to the rear cockpit. (via J. Fink)

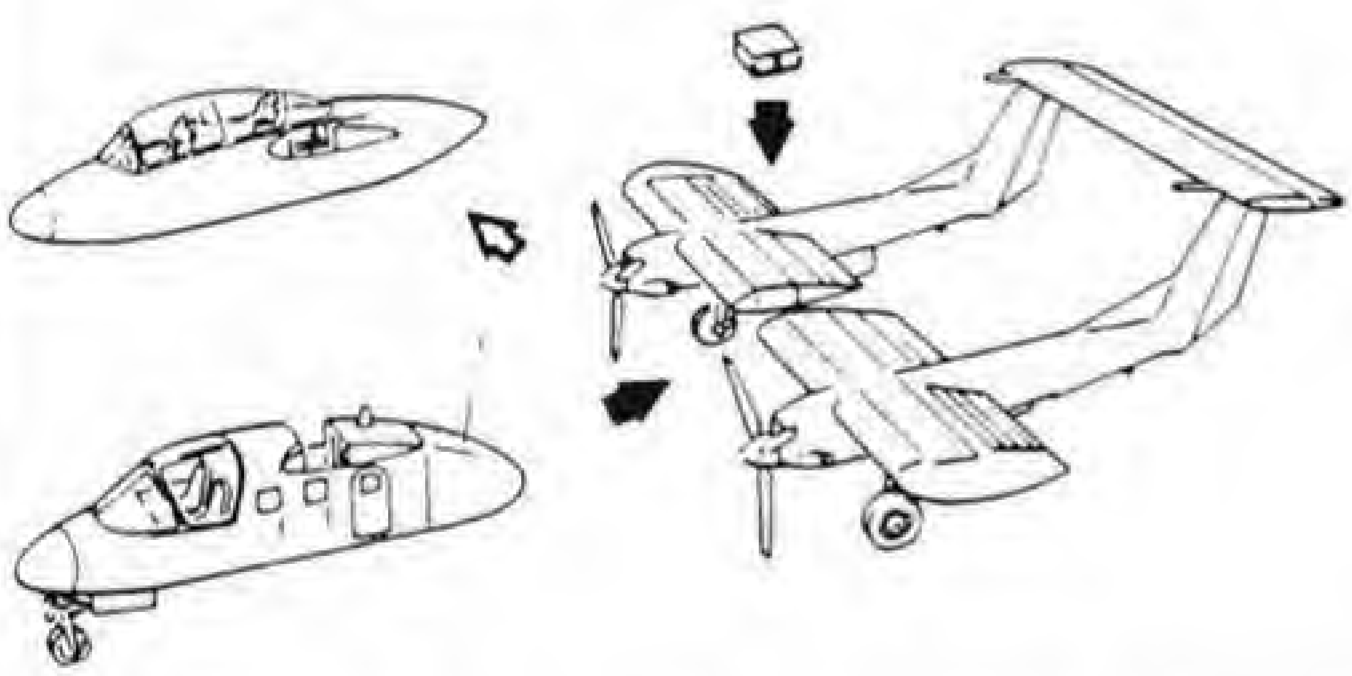
CHARGER COMMONALITY AND GROWTH POTENTIAL

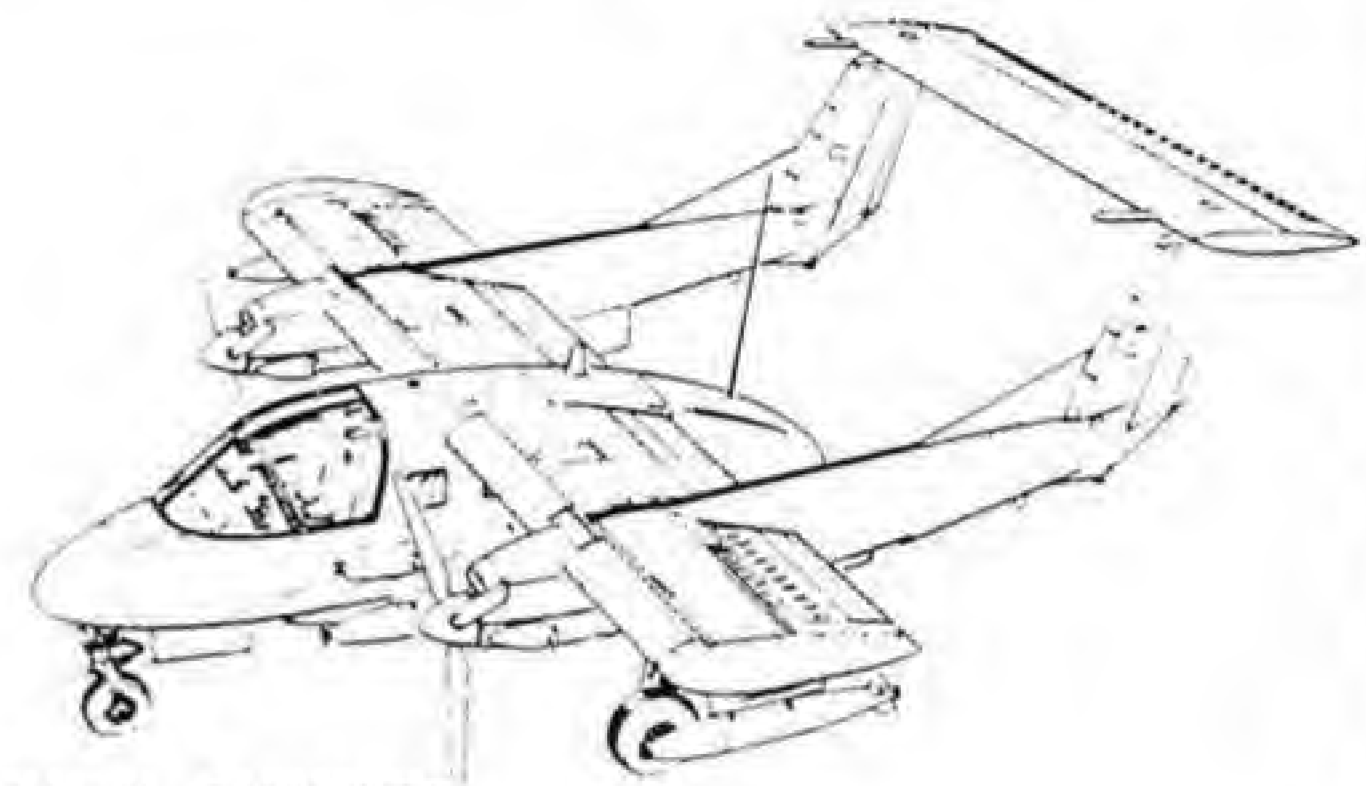


PROTOTYPE LARA

PRODUCTION LARA

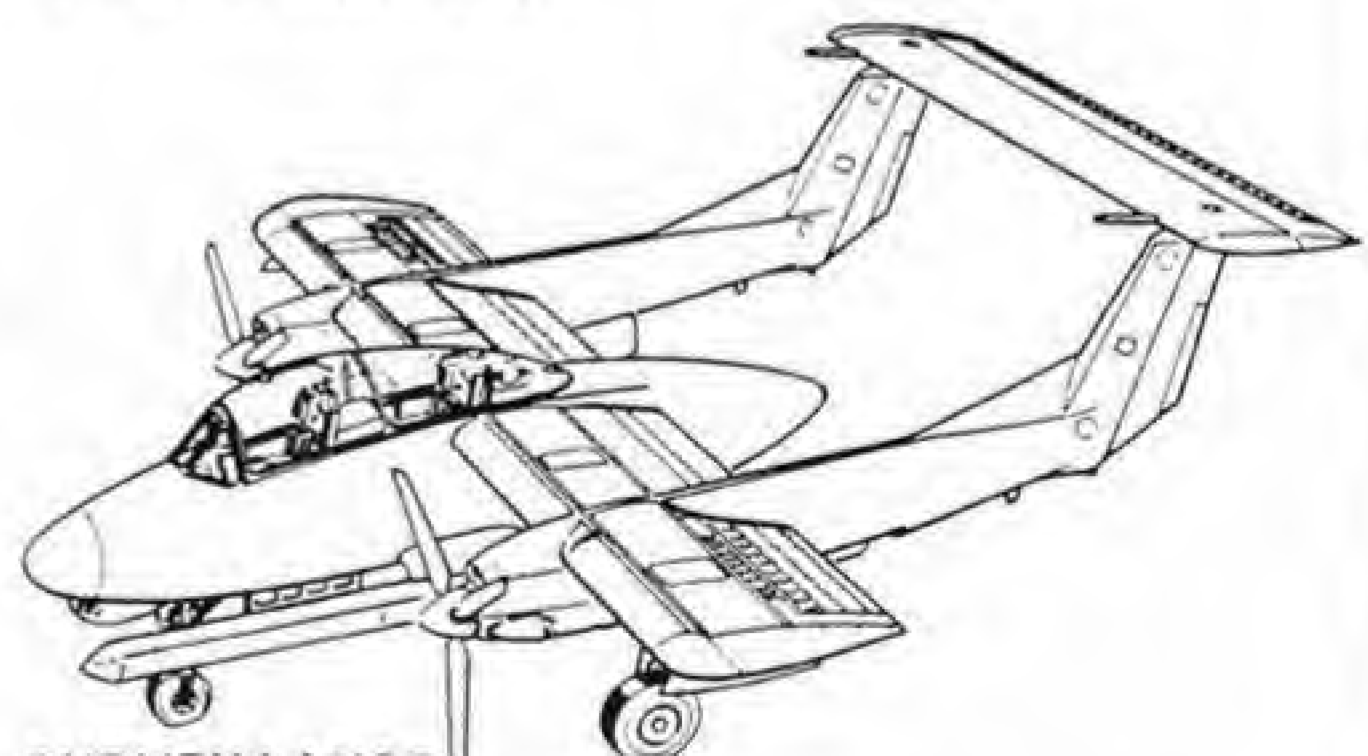
NEW MODELS ARE CREATED BY ADDING DESIRED FUSELAGE TO PRODUCTION MODEL'S WING AND TAILS



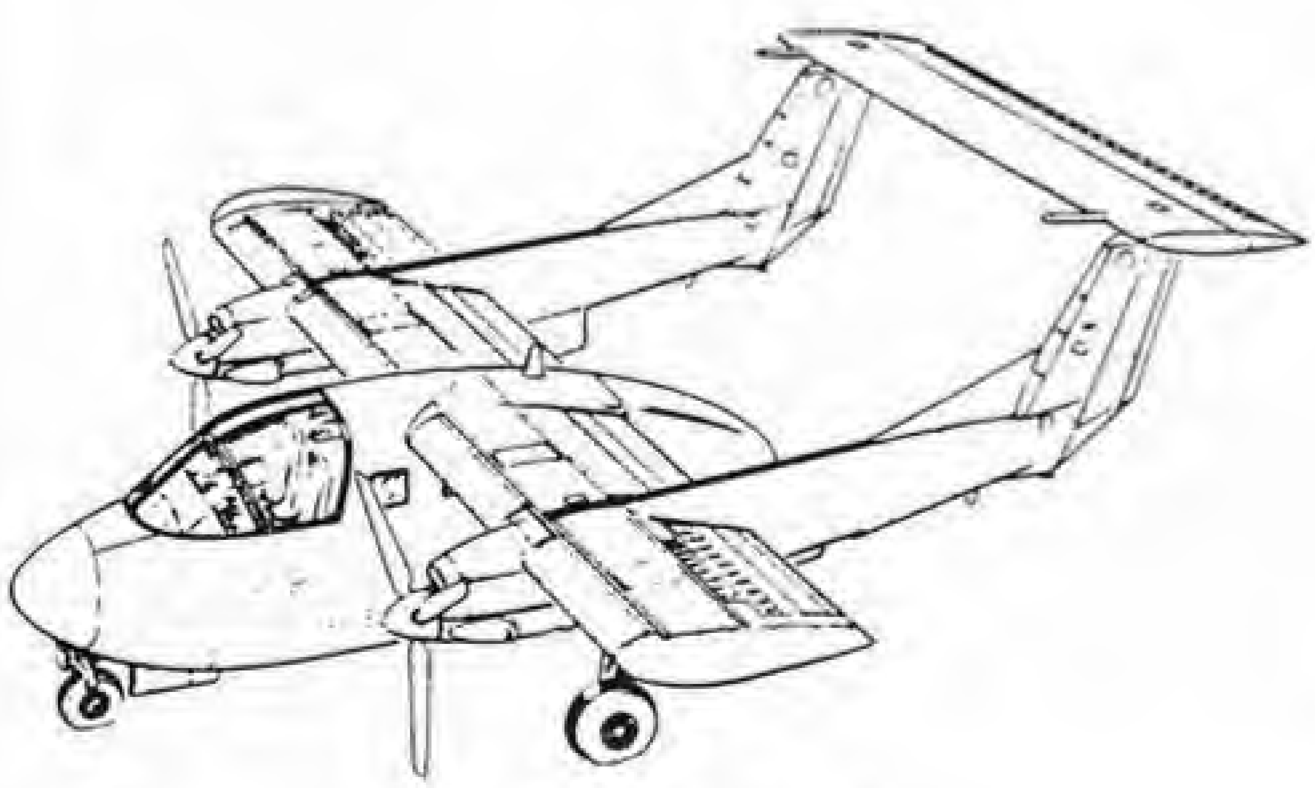


CIVIL SUPPORT
6 PARATROOPERS

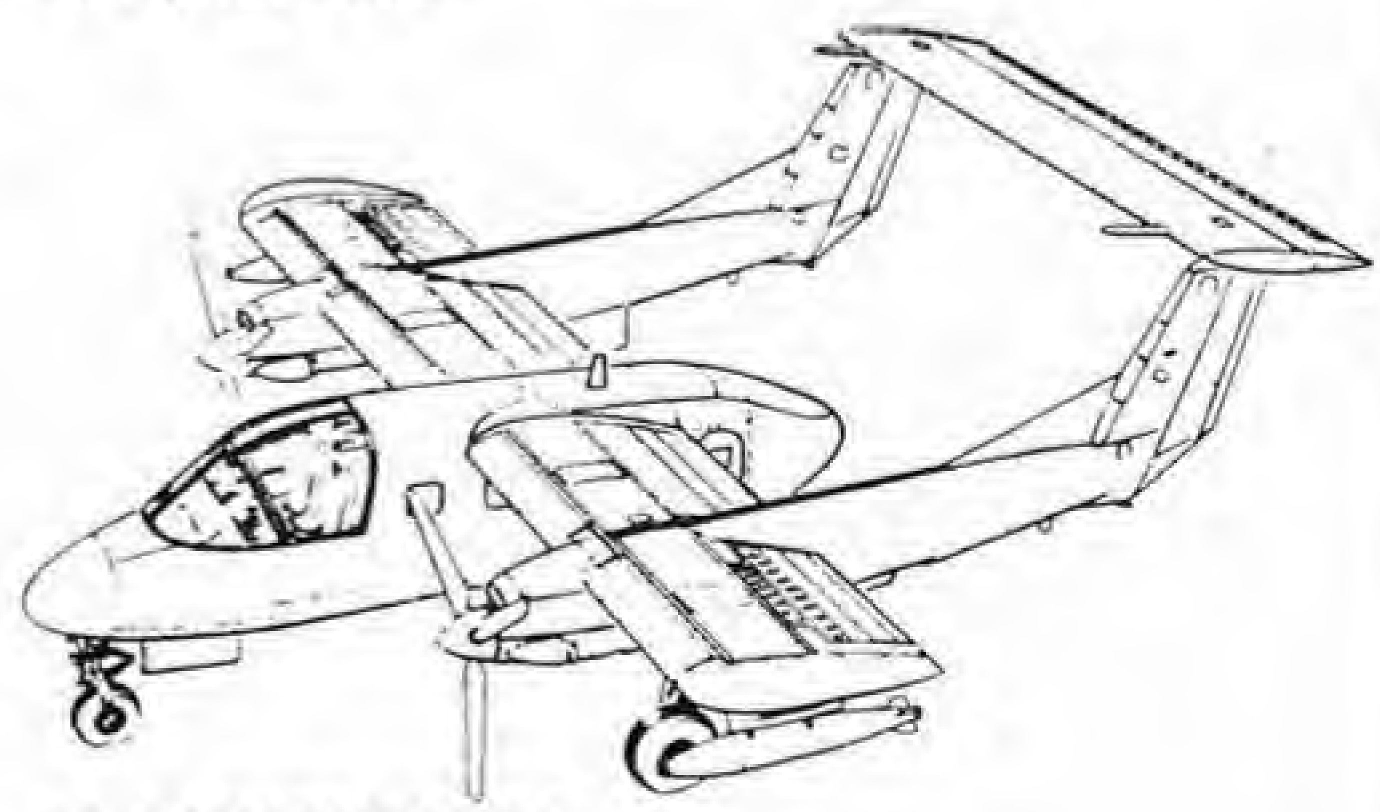
Convair offered its Charger to both military and civilian end users in many different versions of armed and unarmed aircraft, as well as transport versions culminating in the 72.5 foot long Close Support Transport.



SURVEILLANCE

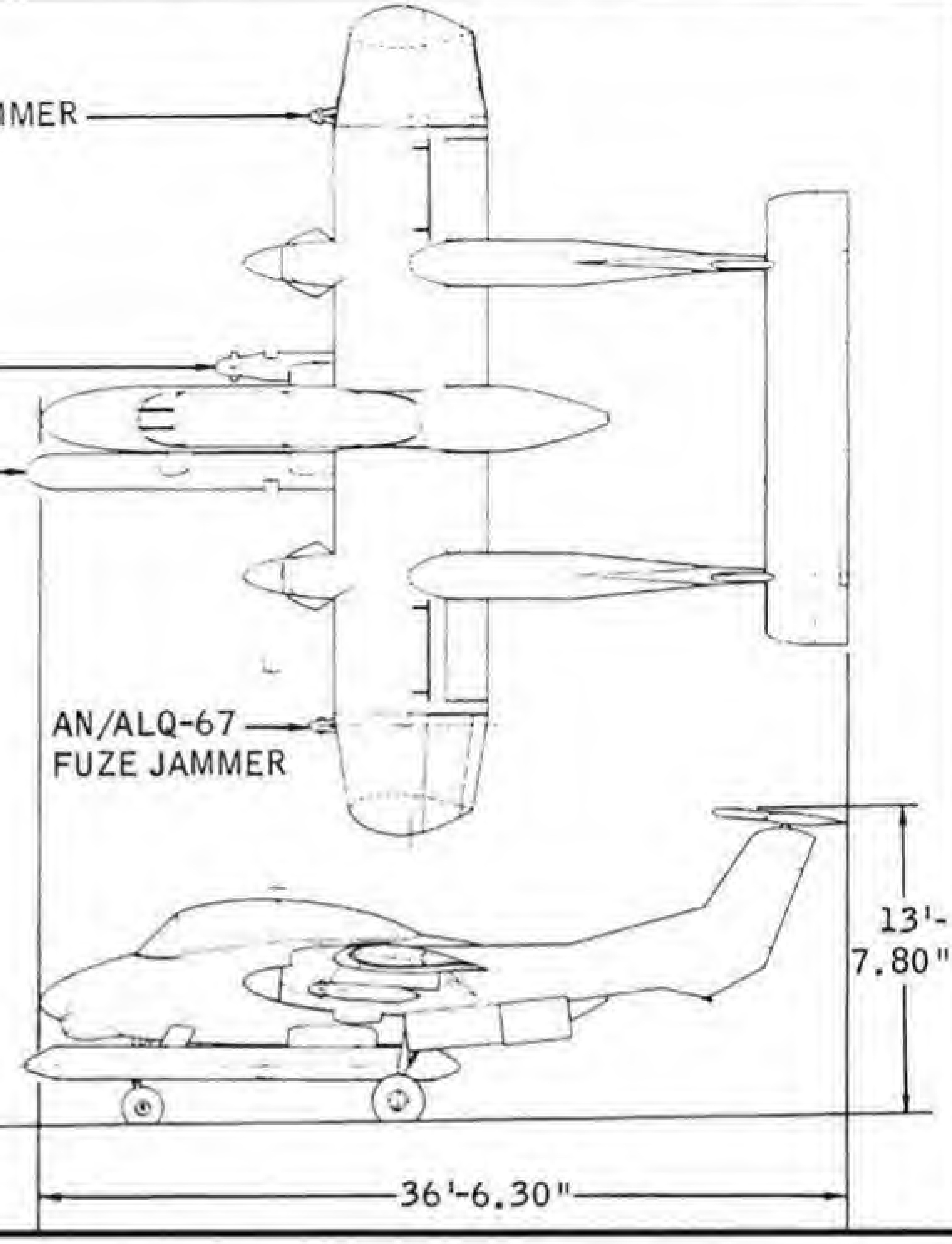


Roughneck



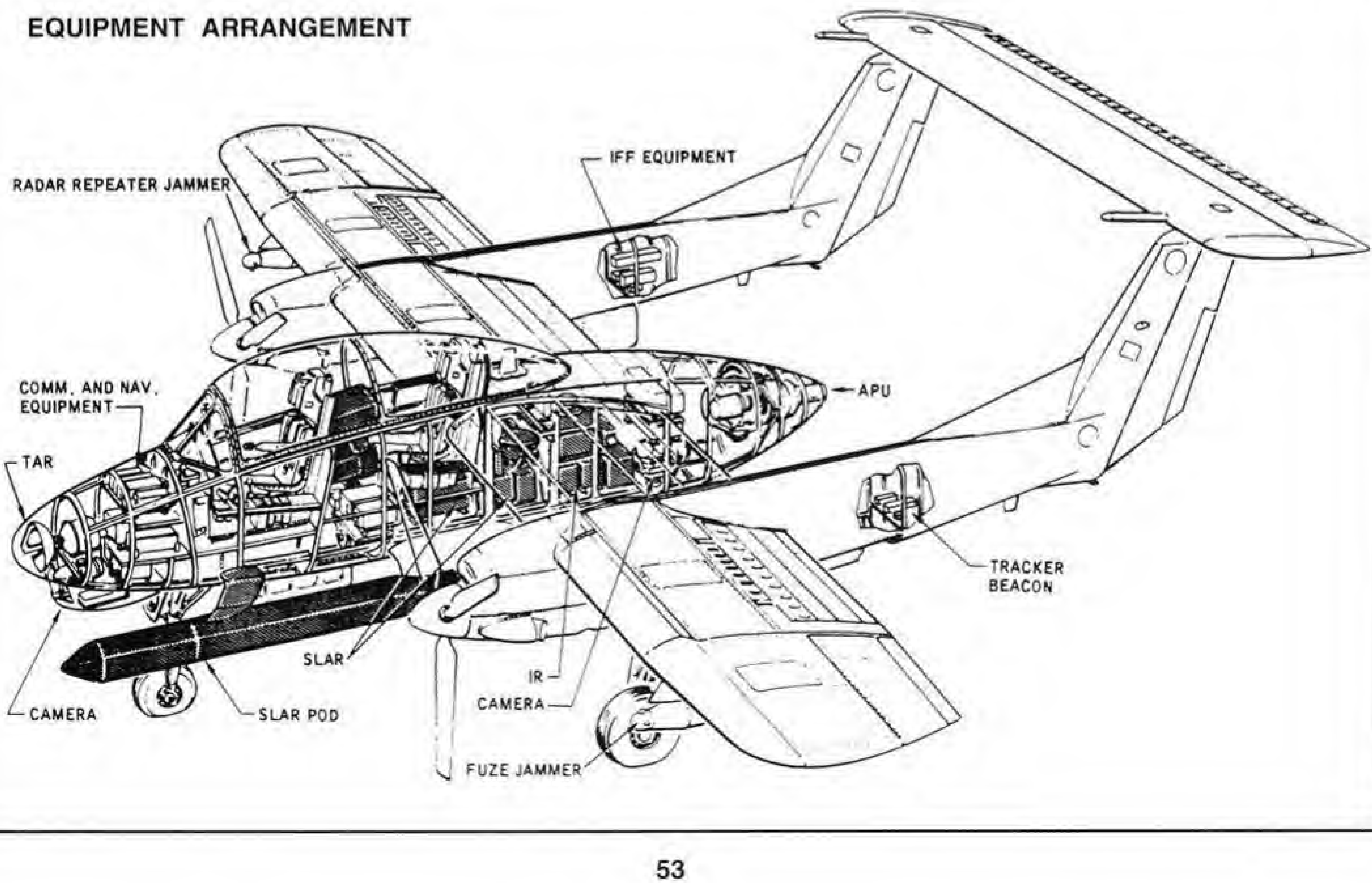
12 PARATROOPERS

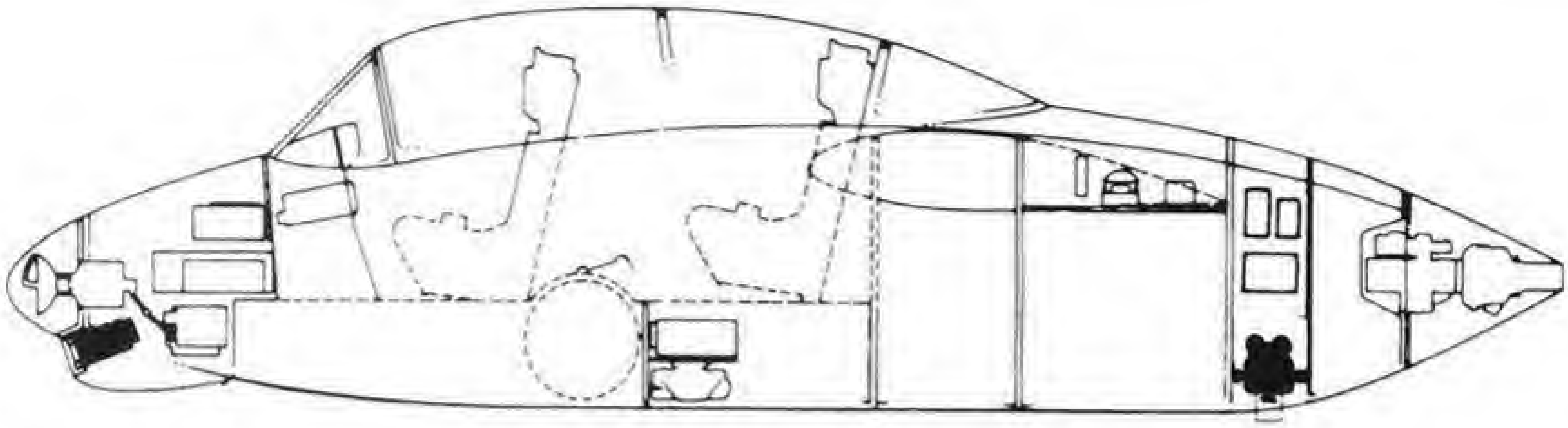
AIRBORNE RECONNAISSANCE AND SURVEILLANCE SYSTEM



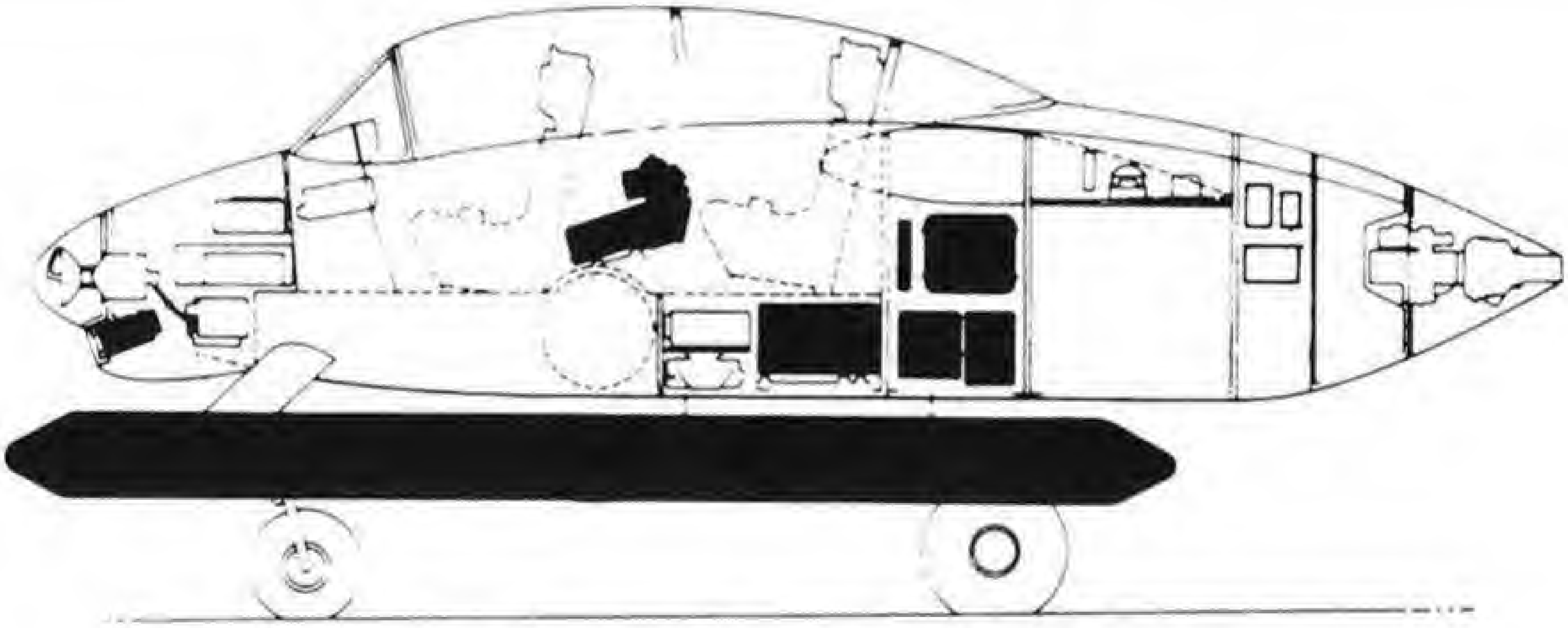
The SLAR configuration came about from an effort to meet the Army's requirement for a stand-off and penetration aircraft, a role that was to be fulfilled by the Grumman OV-1 Mohawk. Airframe wise, there would have been very little difference between the production LARA and the Army's reconnaissance aircraft. The prodigious cargo areas of the Charger would have been packed with the electronic gear needed to fulfill this mission.

EQUIPMENT ARRANGEMENT

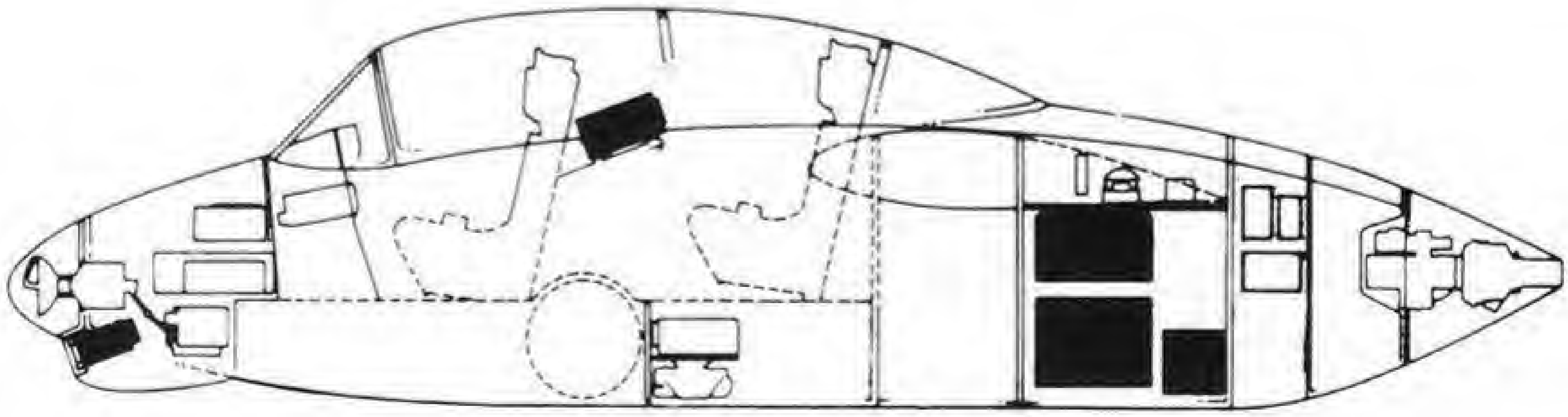




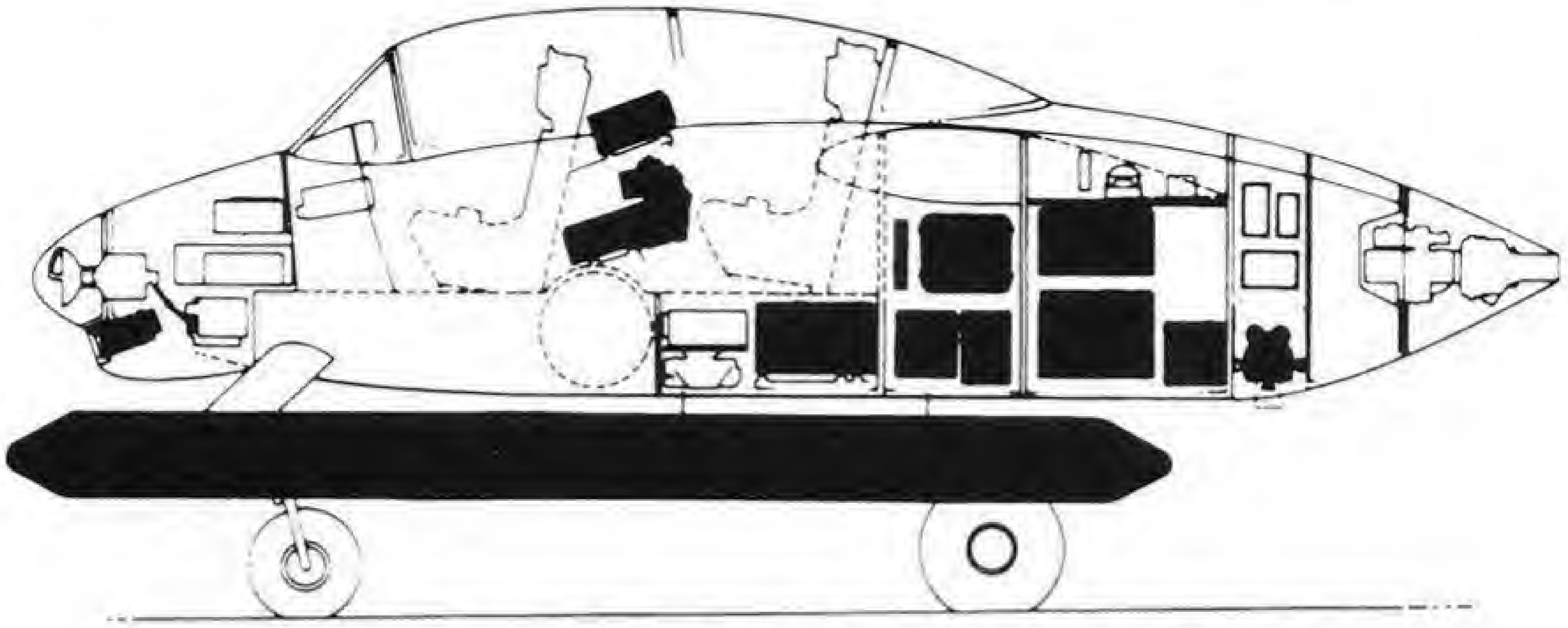
A. PHOTOGRAPHIC



B. SLAR AND PHOTOGRAPHIC

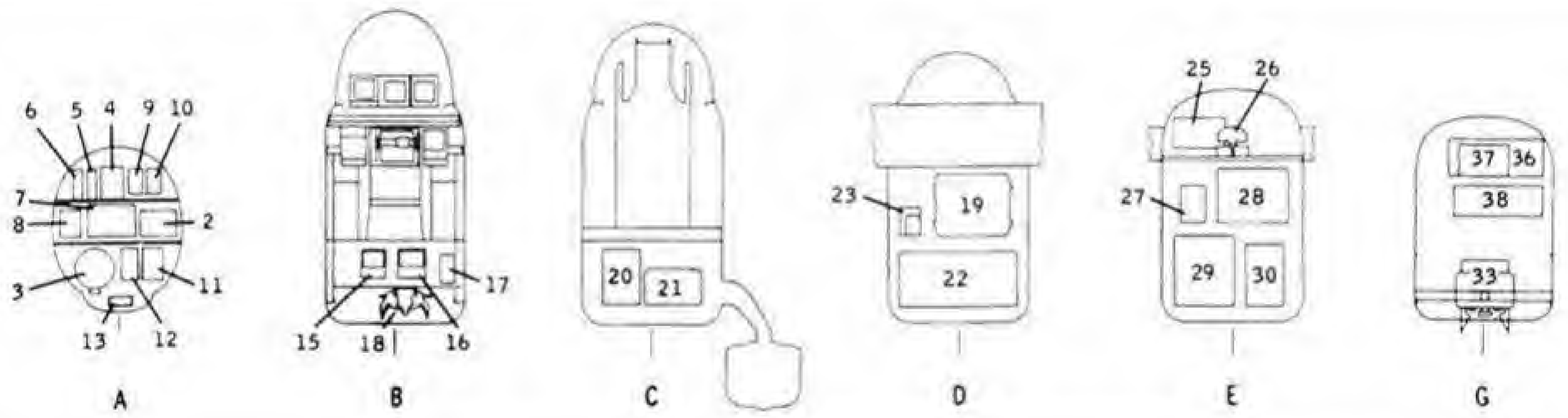


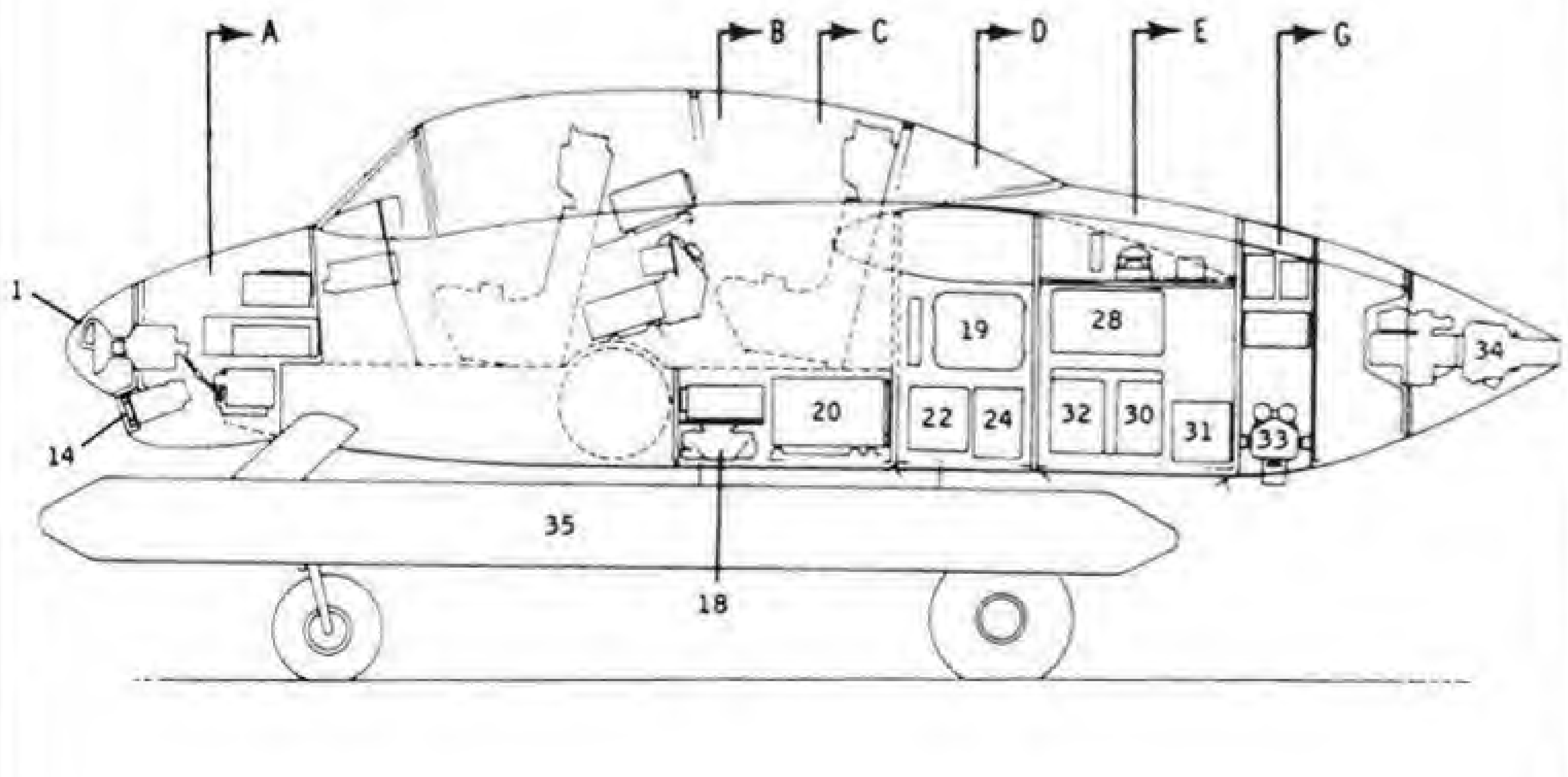
C. INFRARED AND PHOTOGRAPHIC



D. SLAR, INFRARED AND PHOTOGRAPHIC

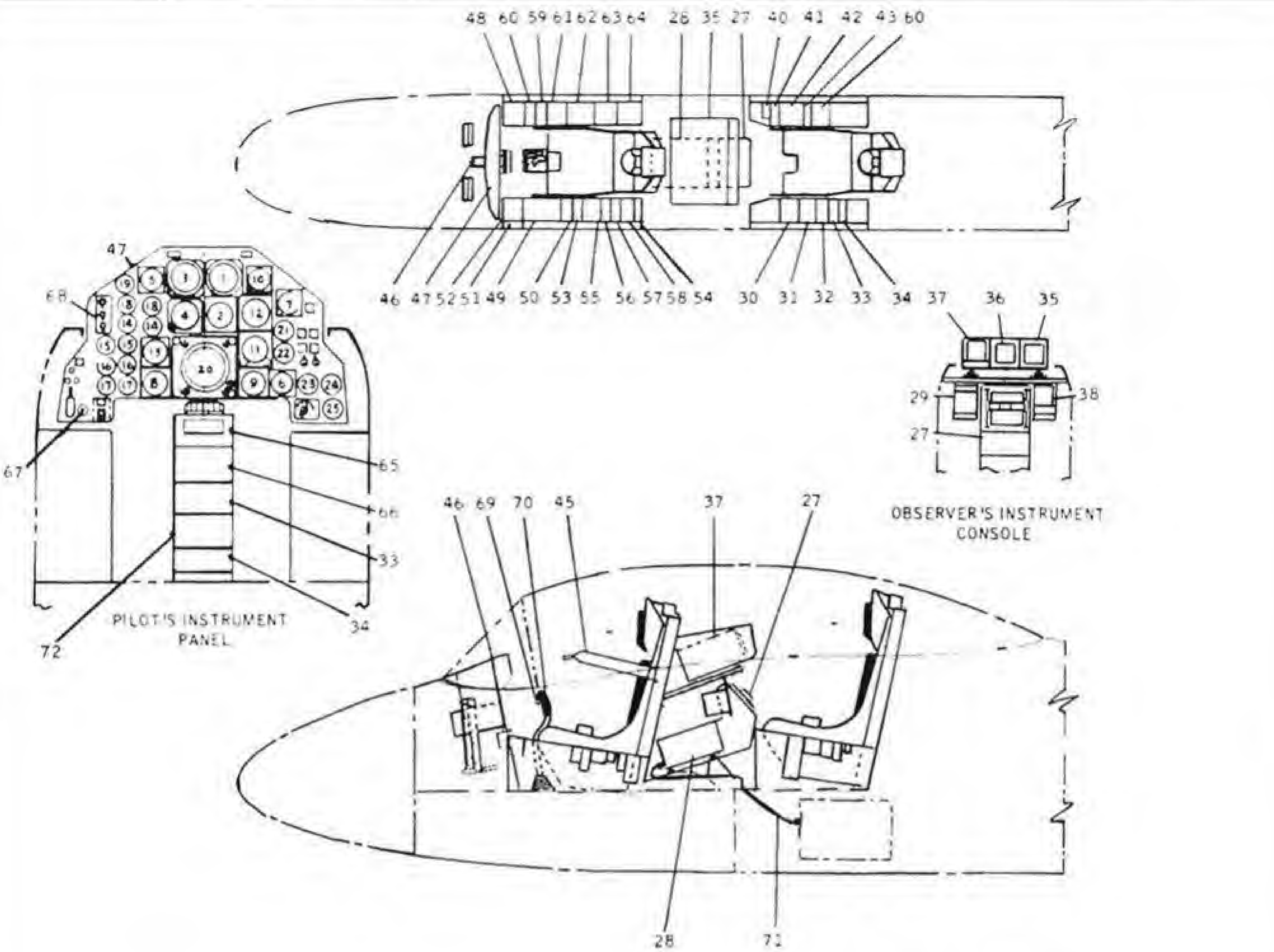
FUSELAGE ELECTRONICS ARRANGEMENT





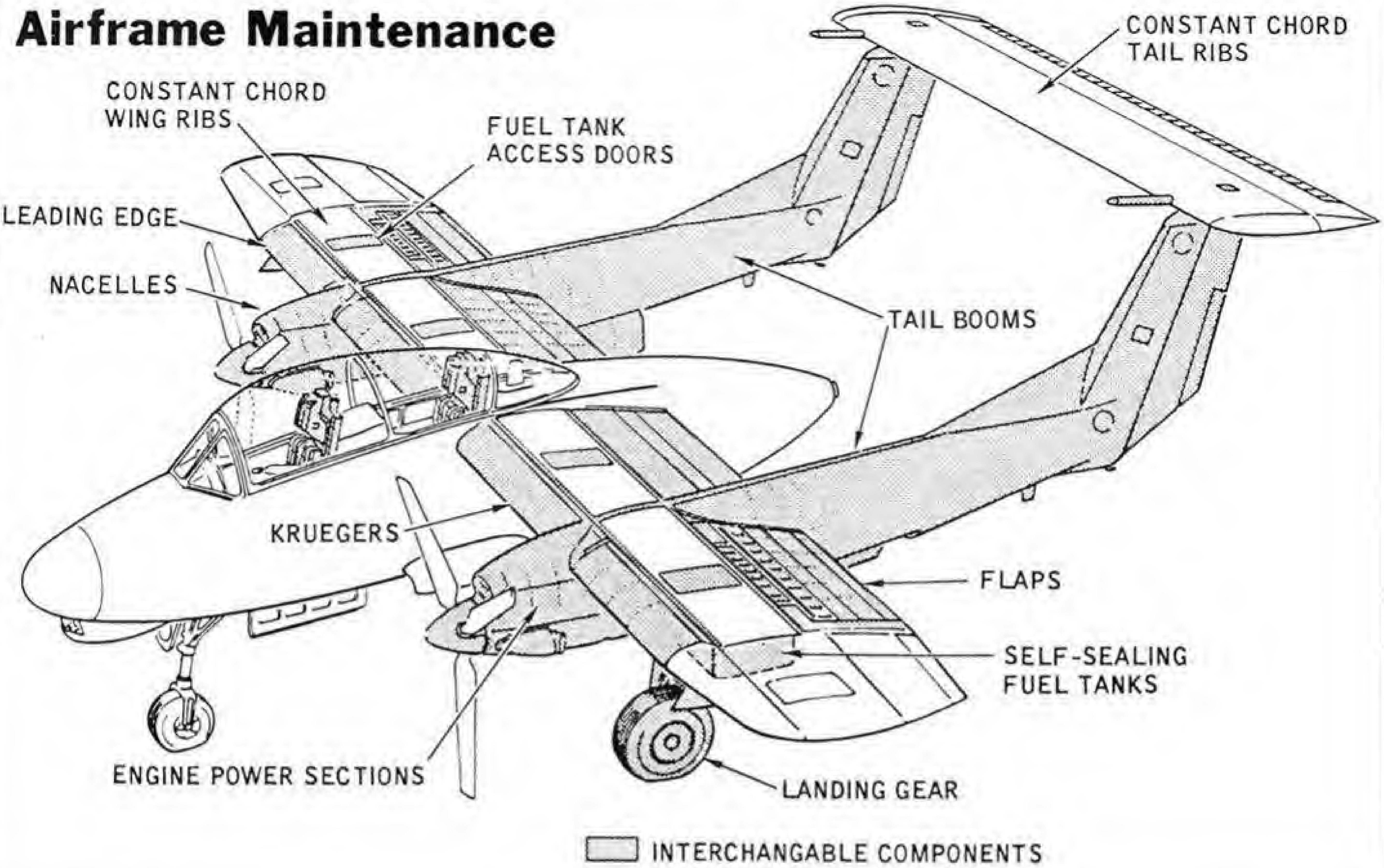
1. AN/APN-165 T.A.R. ANTENNA
2. AN/APN-165 POWER SUPPLY
3. AN/APN-165 TRANSMITTER
4. AN/APN-165 COMPUTER
5. AN/ASN-33 COMPUTER
6. AN/ASN-33 AMPLIFIER
7. AN/ARC-102 TRANSCEIVER
8. AN/ARC-54 TRANSMITTER
9. R1297/ARR RECEIVER
10. AN/ARC 111 POWER SUPPLY
11. AN/ARN-59 RECEIVER
12. AN/ARN-59 DYNAMOTOR
13. AN/ARN-59 ANTENNA
14. KA-60 CORRELATION CAMERA
15. AN/APN-168 DOPPLER NAV. COMPUTER
16. AN/APN-168 FREQUENCY - TRACKER
17. AN/APN-168 RECEIVER - TRANSMITTER
18. AN/APN-168 DOPPLER ANTENNA
19. AN/APS-94A SLAR REC. - TRANS.
20. AN/APS-94A SLAR SYNCHRONIZER
21. AN/APS-94A SLAR SIGNAL COMPARATOR
22. AN/APS-94A SLAR POWER SUPPLY
23. AN/AKT-18 DATA LINK TRANS. (SLAR)
24. AN/AKT-18 DATA LINK VIDEO ENCODER
25. AN/ASN-62 CONTROL AMPLIFIER
26. AN/ASN-62 DIRECTIONAL GYRO
27. AN/AAS-14 INFRARED DATA AMPLIFIER
28. AN/AAS-14 INFRARED RECORDER GROUP
29. AN/AAS-14 INFRARED RECEIVER GROUP
30. AN/AAS-14 INFRARED POWER SUPPLY
31. AN/AAS-14 INFRARED CRYOGENIC REFRIG.
32. AN/ART-41 DATA LINK TRANS (INFRARED)
33. KA-63 CAMERA SYSTEM
34. AUXILIARY POWER UNIT (OPTIONAL)
35. AN/APS-94A SLAR ANTENNA POD
36. AN/ARR-70 PRE-SELECTOR } DATA RELAY EQUIP.
37. AN/ARR-70 RECEIVER } DATA RELAY EQUIP.
38. AN/ART-46 TRANSMITTER } DATA RELAY EQUIP.

AIRBORNE RECONNAISSANCE COCKPIT ARRANGEMENT

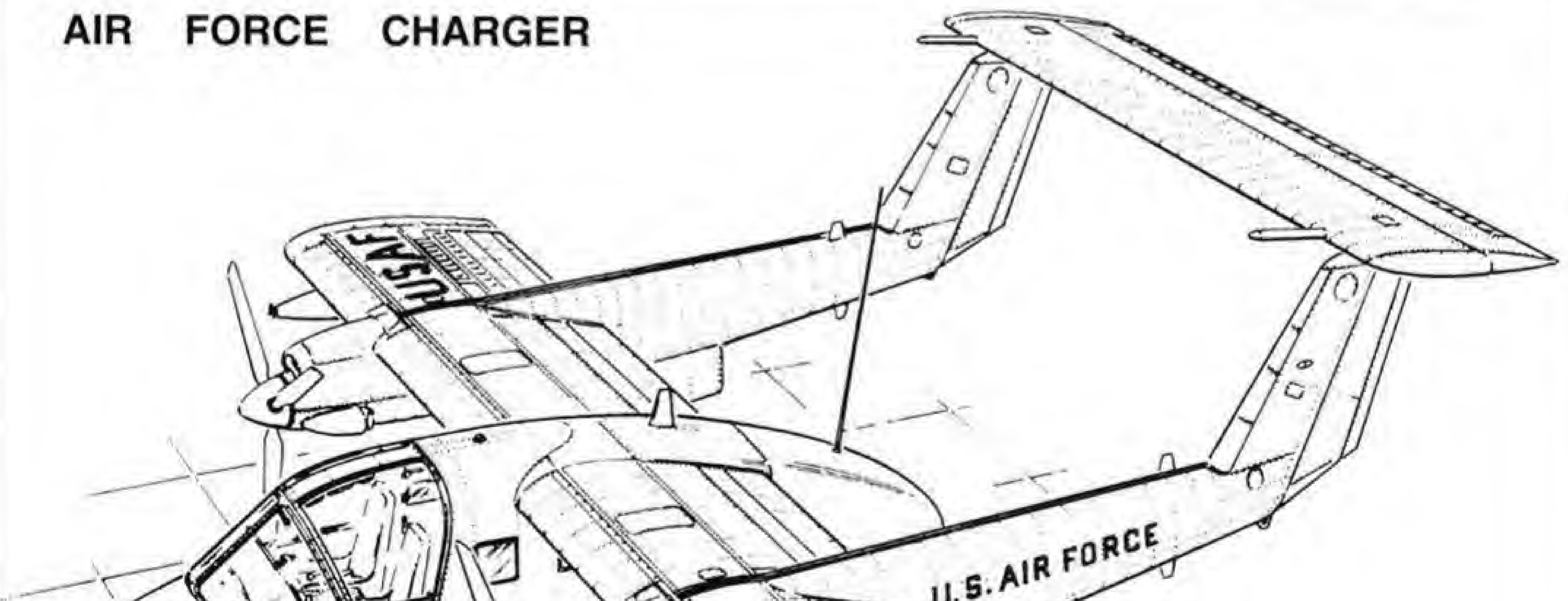


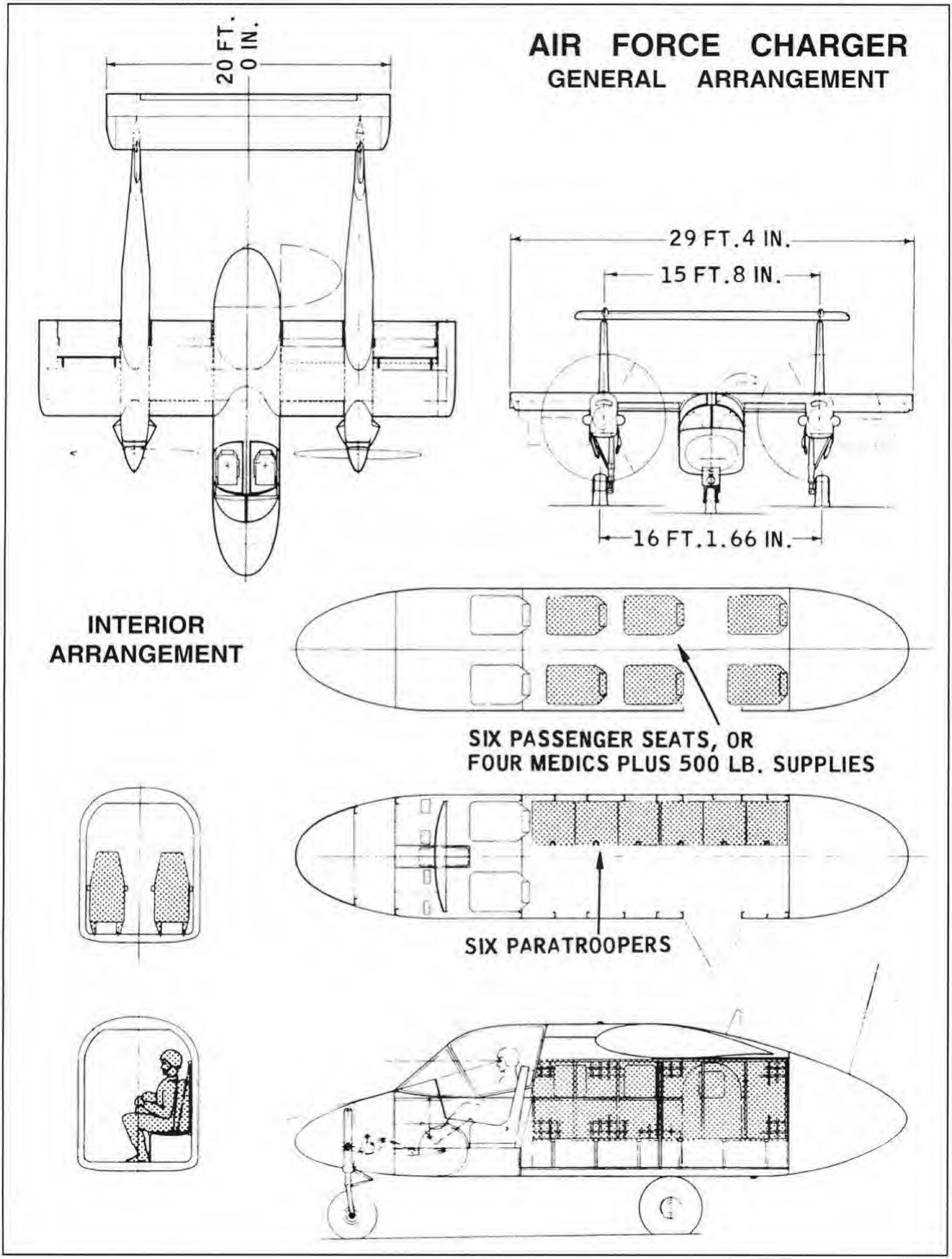
1. GYRO HORIZON
2. HEADING INDICATOR
3. AIRSPEED INDICATOR
4. ALTIMETER
5. TURN AND BANK INDICATOR
6. RATE OF CLIMB INDICATOR
7. CLOCK
8. RADAR ALTIMETER ASN-64
9. DOPPLER INDICATOR ASN-64
10. ACCELEROMETER
11. COURSE INDICATOR ASN-33
12. ATTITUDE INDICATOR ASN-33
13. ANGLE OF ATTACK INDICATOR
14. E G T INDICATOR (2)
15. N_1 TACHOMETER (2)
16. N_2 TACHOMETER (2)
17. INDICATOR TORQUE (2)
18. INDICATOR OIL TEMPERATURE (2)
19. INDICATOR OIL PRESSURE (1) DUAL
20. T.A.R. APN-165 (SPACE PROVISIONS)
21. FUEL QUANTITY INDICATOR
22. HYDRAULIC PRESSURE INDICATOR
23. LONGITUDINAL TRIM INDICATOR
24. LATERAL TRIM
25. RUDDER TRIM INDICATOR
26. STANDBY COMPASS (NOT SHOWN)
27. "SLAR" RADAR MAPPING PROCESSOR-VIEWER RECORDER APS-94A
28. "SLAR" RADAR TARGET INDICATOR APS-94A
29. "SLAR" RADAR SET CONTROL APS-94A
30. "SLAR" VIDEO SIGNAL MONITOR APS-94A
31. "SLAR" RECORDER CONTROL APS-94A
32. RADAR DATA TRANSFER CONTROL SB-1111/AKT-16
33. C-1611/AIC INTERPHONE PANEL (2)
34. CAMERA CONTROL PANEL
35. I.R. "B" SCOPE
36. I.R. "B" SCOPE
37. I.R. "A" SCOPE
38. I.R. CONTROL PANEL
39. I.R. CONTROL PANEL
40. OBSERVER'S MANUAL CAMERA PULSE CONTROL
41. FLARE RESET CONTROL
42. PHOTO CONTROL PANEL
43. EXPOSURE CONTROL PANEL
44. OBSERVER'S MAP/DATA STOWAGE
45. CAMERA OBLIQUE SIGHT-LEFT & RIGHT
46. PHOTO FLIGHT LINE SIGHT
47. PILOT'S INSTRUMENT PANEL
48. PILOT'S ELECTRICAL POWER PANEL
49. THROTTLE QUADRANT
50. AN/ARC-111 VHF-AM CONTROL PANEL
51. LANDING LIGHT CONTROL
52. T.A.R. CONTROL PANEL (SPACE PROV.)
53. ASN-62 COMPASS CONTROLLER
54. ASN-62 COMPASS COMPENSATOR MAG. FLUX
55. AN/APX-68 I.F.F. R-T CONTROL PANEL
56. MK-12 I.F.F. CONTROL PANEL
57. ARC-102 H.F. COMM. CONTROL PANEL
58. ARN-59 L.F. ADF CONTROL PANEL
59. ARC-54 VHF-FM CONTROL PANEL
60. ARN-30E V.O.R. CONTROL PANEL (2)
61. ASN-64 DOPPLER CONTROL PANEL
62. LIGHTING CONTROL PANEL
63. AIR CONDITIONING CONTROL PANEL
64. AN/ARR 70 RADIO RELAY RECEIVER CONTROL (2)
65. ASW-12 AUTO PILOT CONTROLLER
66. ASW-12 AUTO PILOT COUPLER
67. ENGINES STARTER SWITCH
68. A.P.U. CONTROLS
69. PILOT'S MANUAL CAMERA PULSE TRIGGER
70. PILOT'S AUTO CAMERA PULSE BUTTON
71. SYCHRONIZER TO INDICATOR CABLE
72. R-1297/ARR-VHF-FM CONTROL AUX. HOMER RECEIVER

Airframe Maintenance

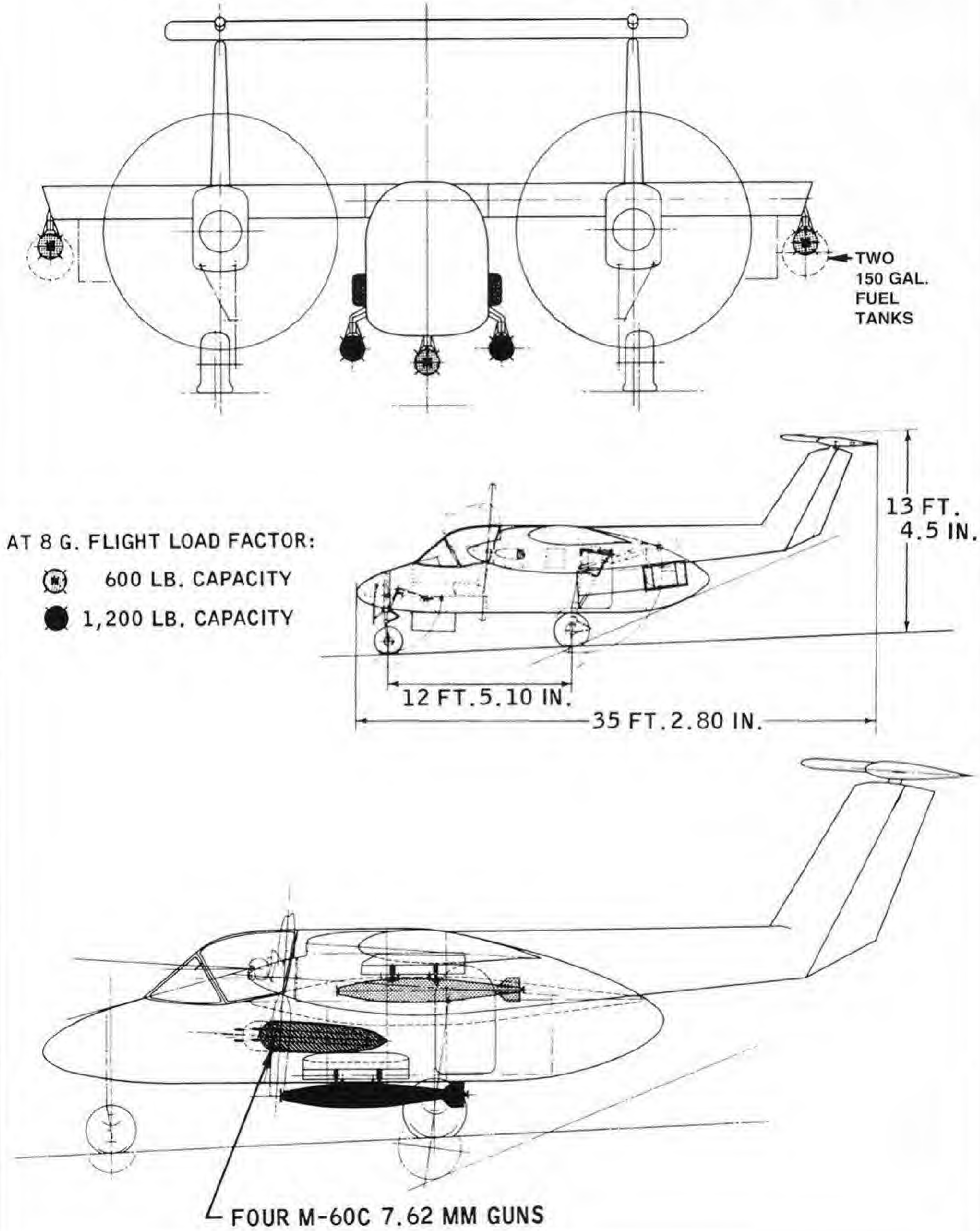


AIR FORCE CHARGER




AIR FORCE CHARGER
GENERAL ARRANGEMENT
20 FT. 0 IN.
29 FT. 4 IN.
15 FT. 8 IN.
16 FT. 1.66 IN.
INTERIOR ARRANGEMENT
SIX PASSENGER SEATS, OR
FOUR MEDICS PLUS 500 LB. SUPPLIES
SIX PARATROOPERS

AIR FORCE CHARGER ARMAMENT ARRANGEMENT



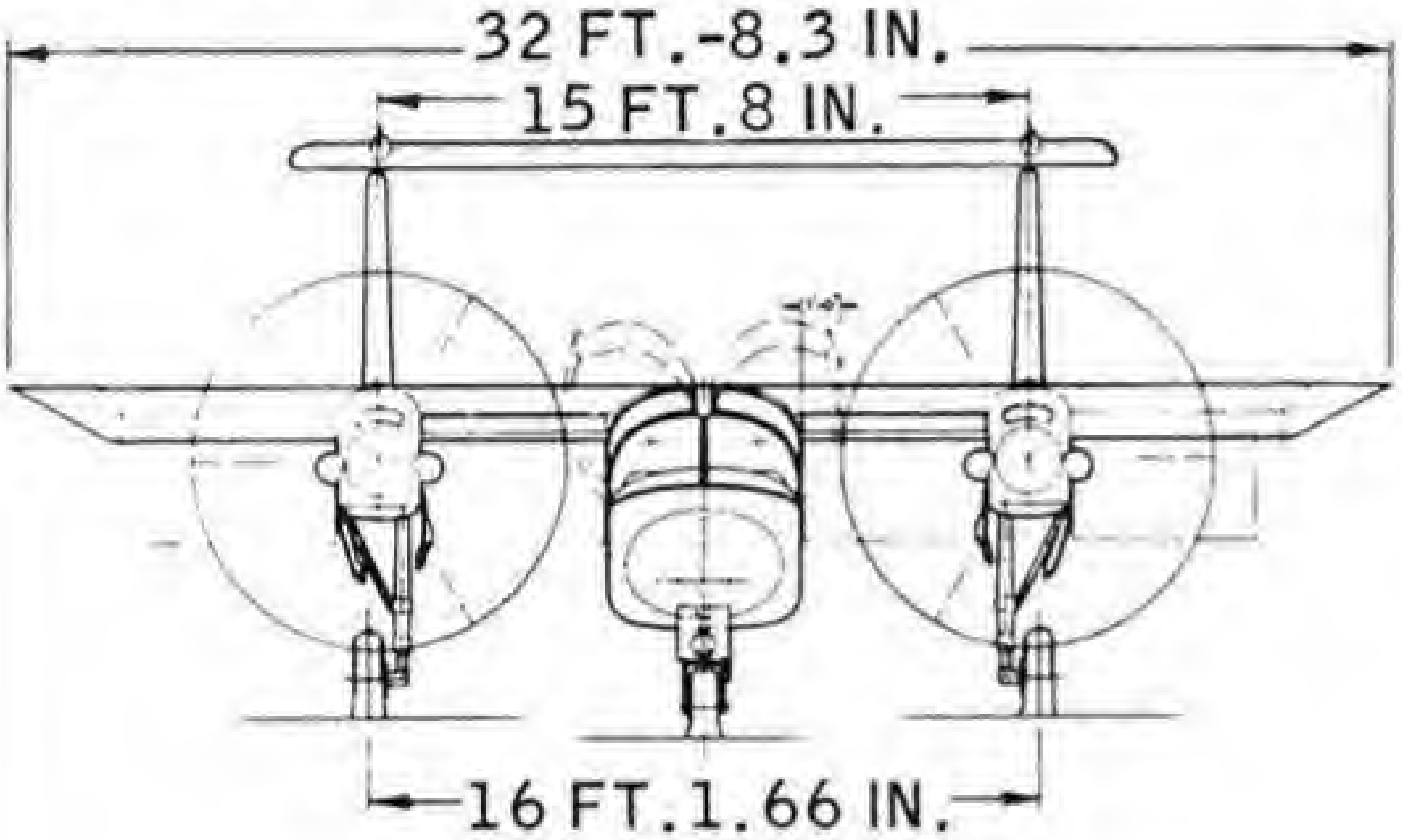
General Arrangement

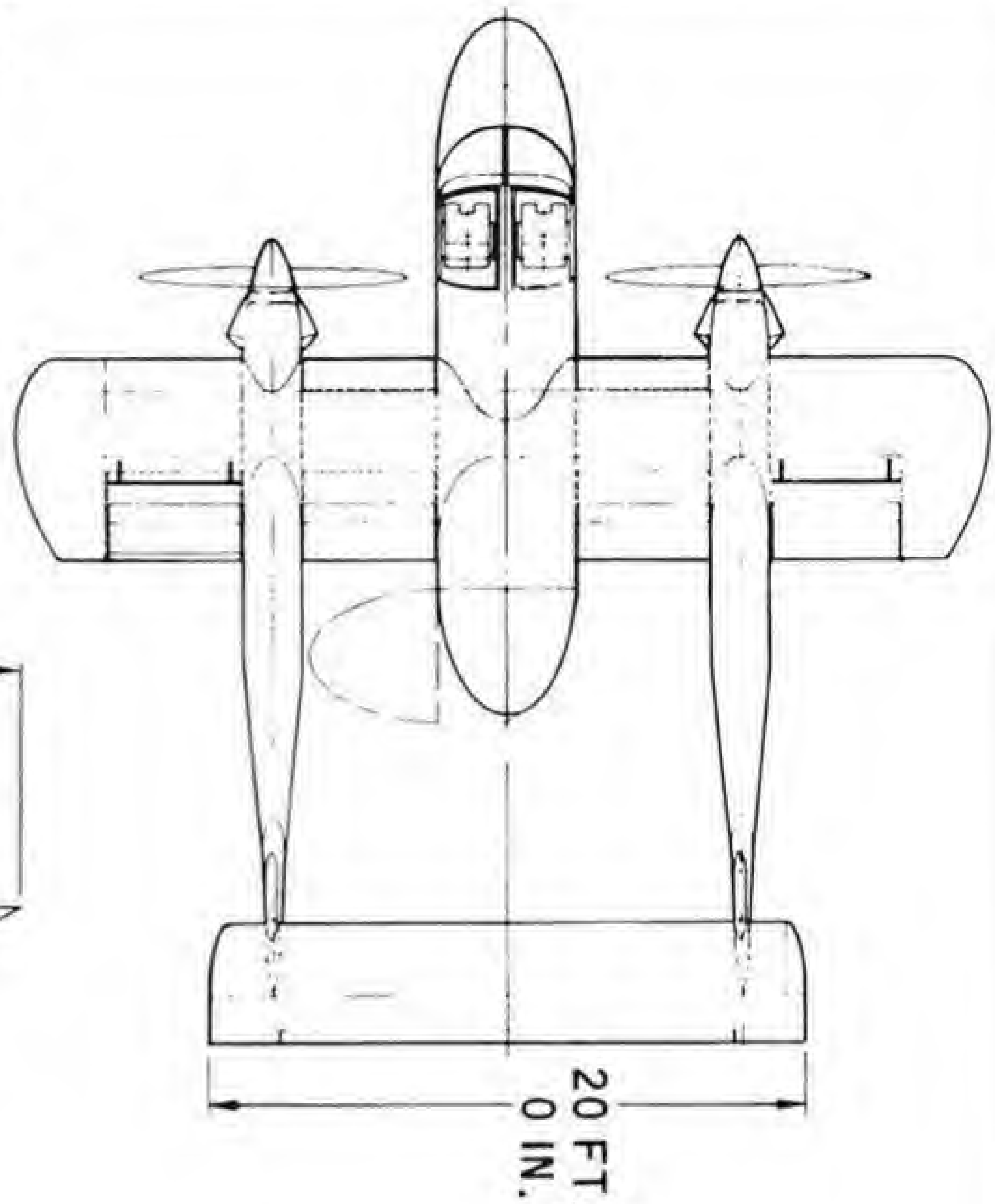
ENGINES: UACL 700-SHP T-74 TURBOPROP

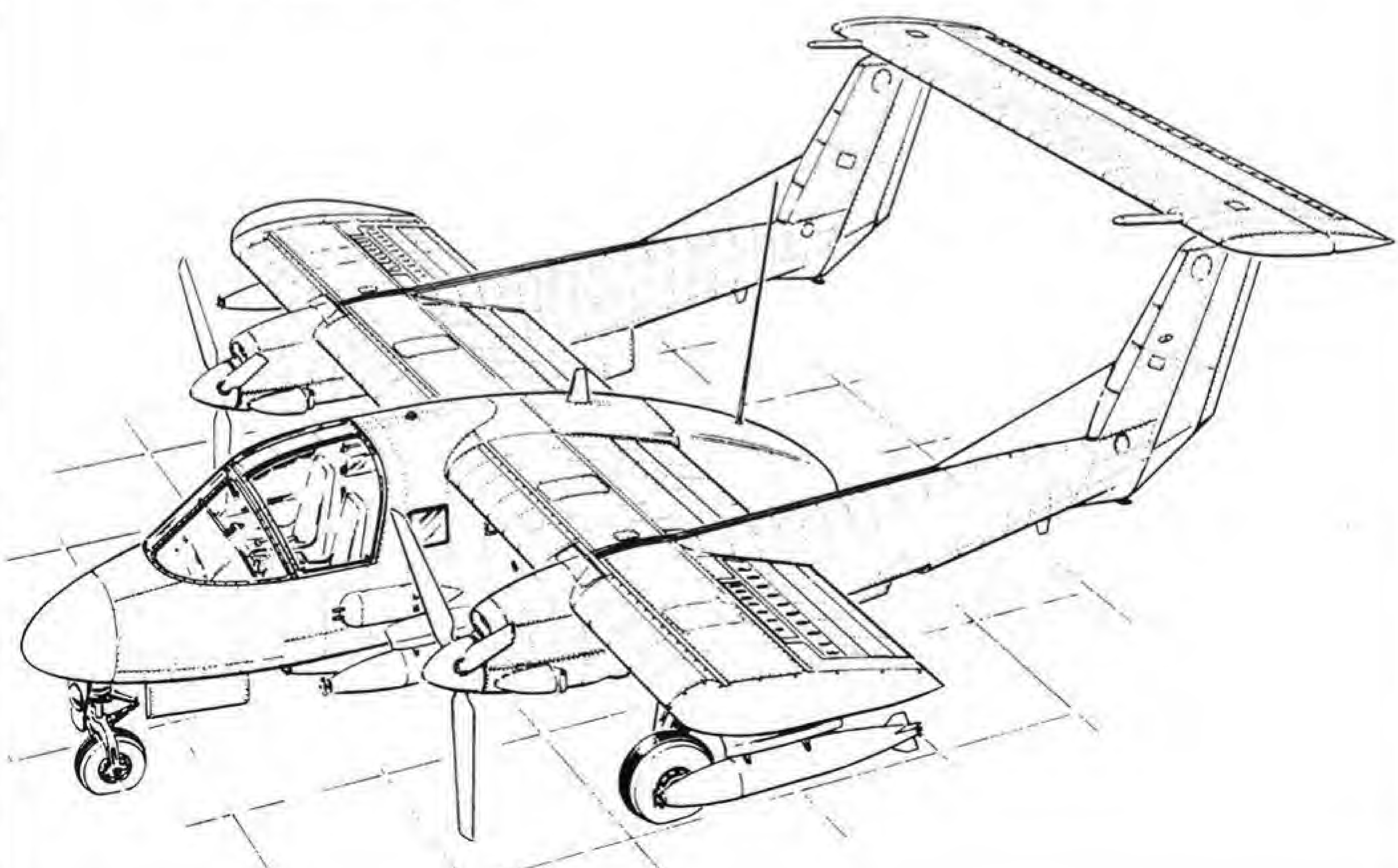
PROPELLERS: HAMILTON-STANDARD 3-BLADED, 8 FT.-6 IN. DIAMETER LH - WITH OPPOSITE ROTATION

TIRES: MAIN GEAR - 8.50-10 10PR TYPE III (25.65 IN. DIA)

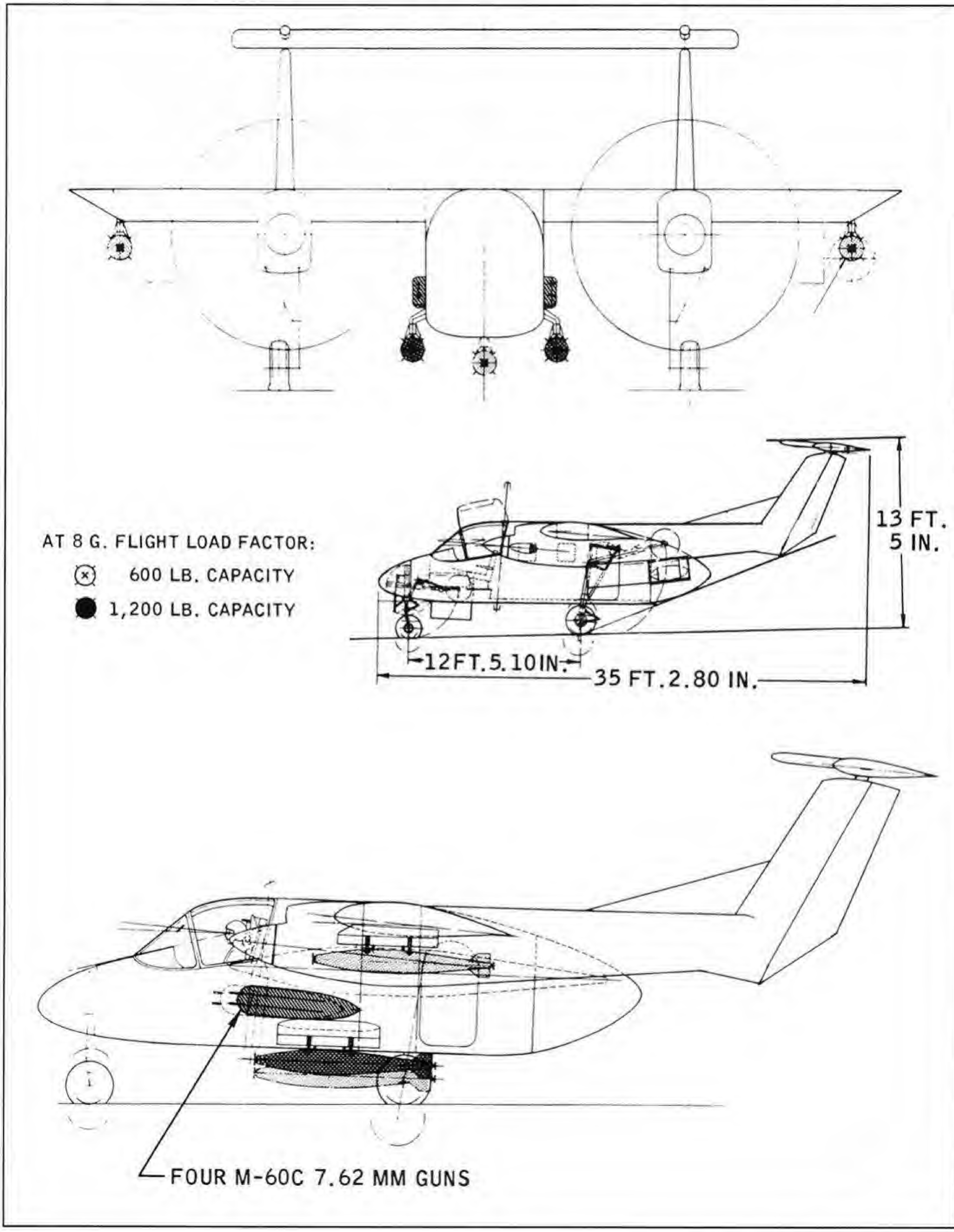
NOSE GEAR - 9.00-6 10PR TYPE III (22.40 IN. DIA)





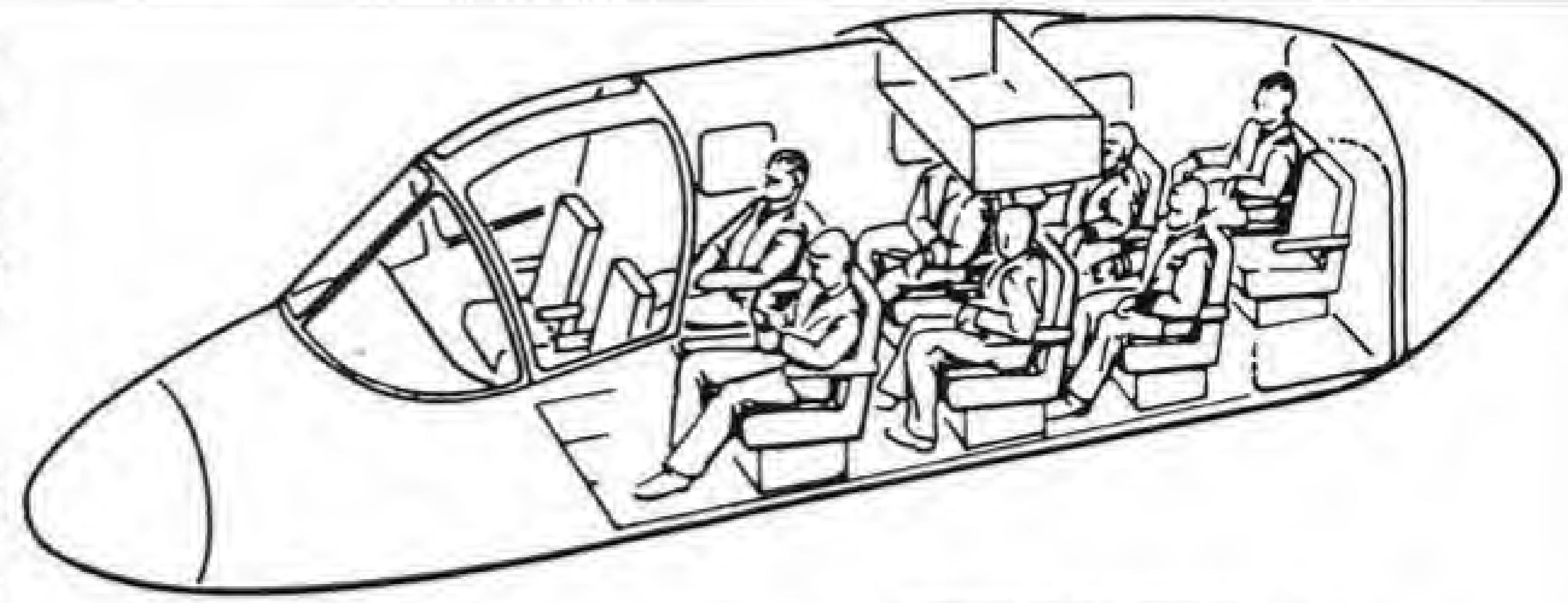


CIVIL SUPPORT AIRPLANE ARMAMENT ARRANGEMENT

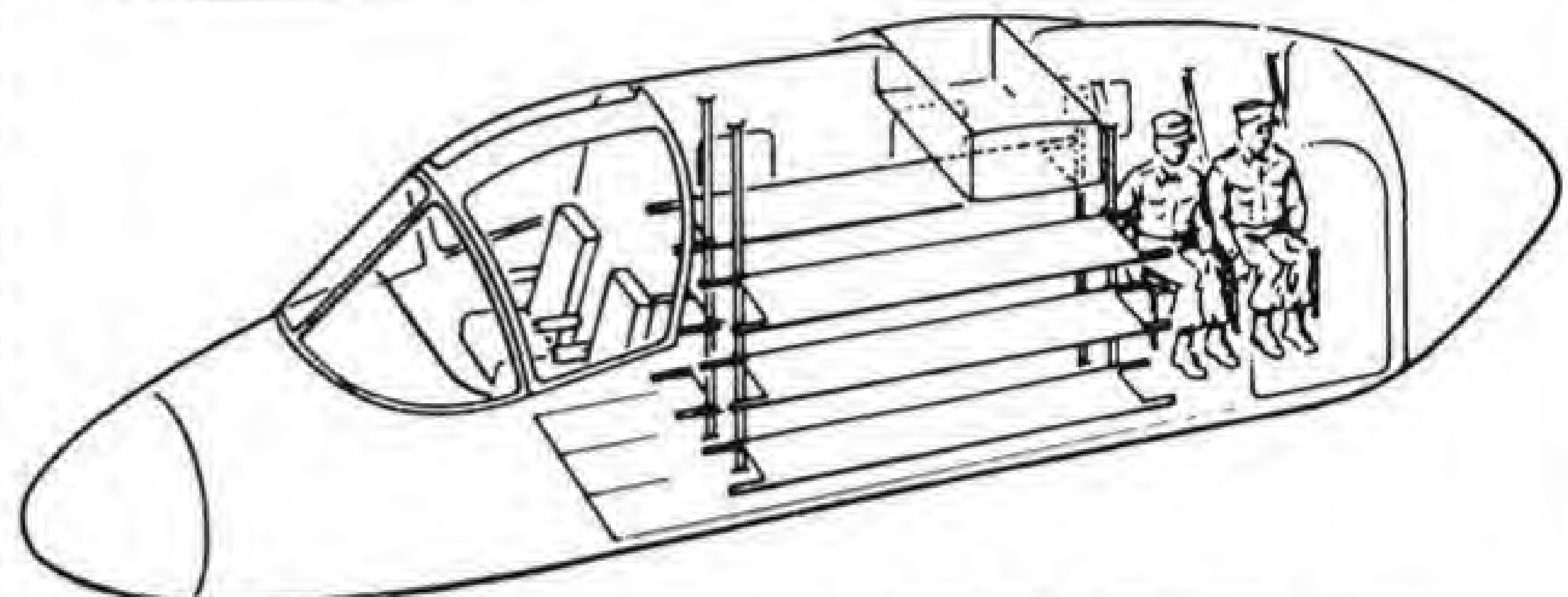


LIGHT ARMED TRANSPORT AIRCRAFT

There are three means of access to the fuselage compartment and flight station: a 27 by 50 inch passenger door in the left side of the fuselage; a swing-aside tail cone, used for cargo and litter-patient loading; and twin canopy hatches, for use by the flight crew when the cargo compartment is fully loaded.

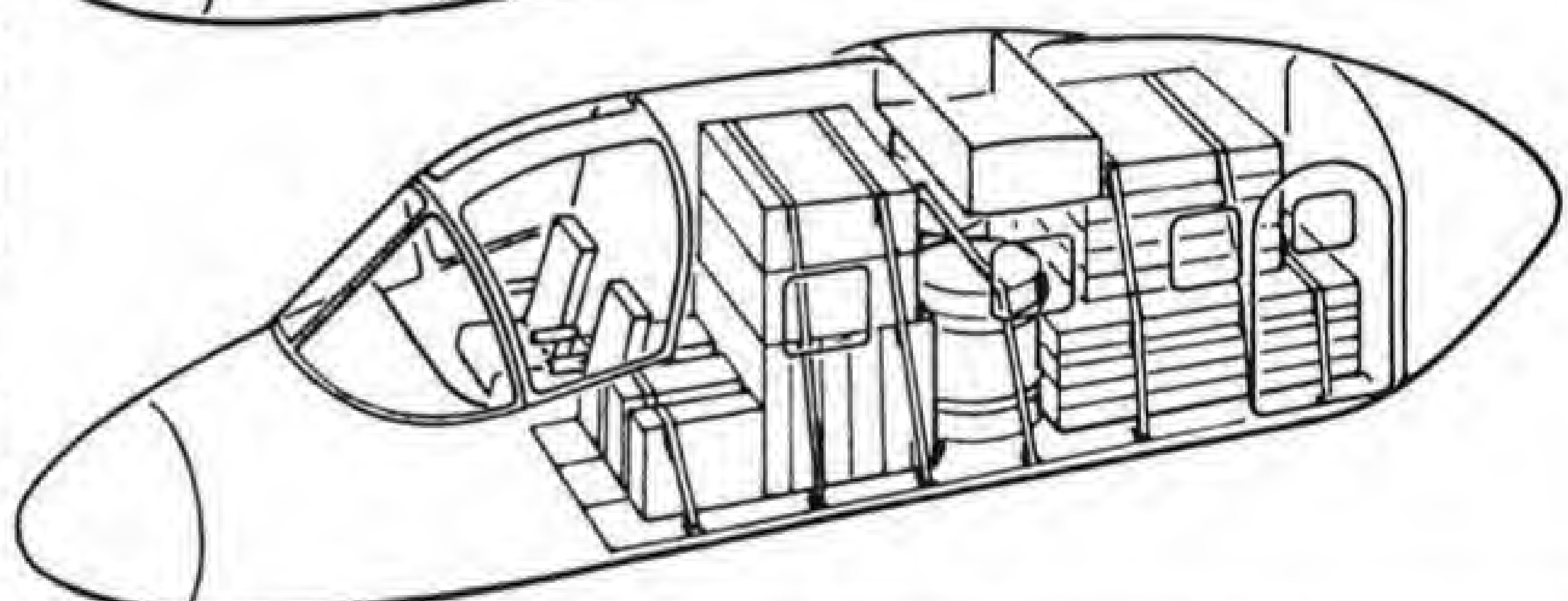


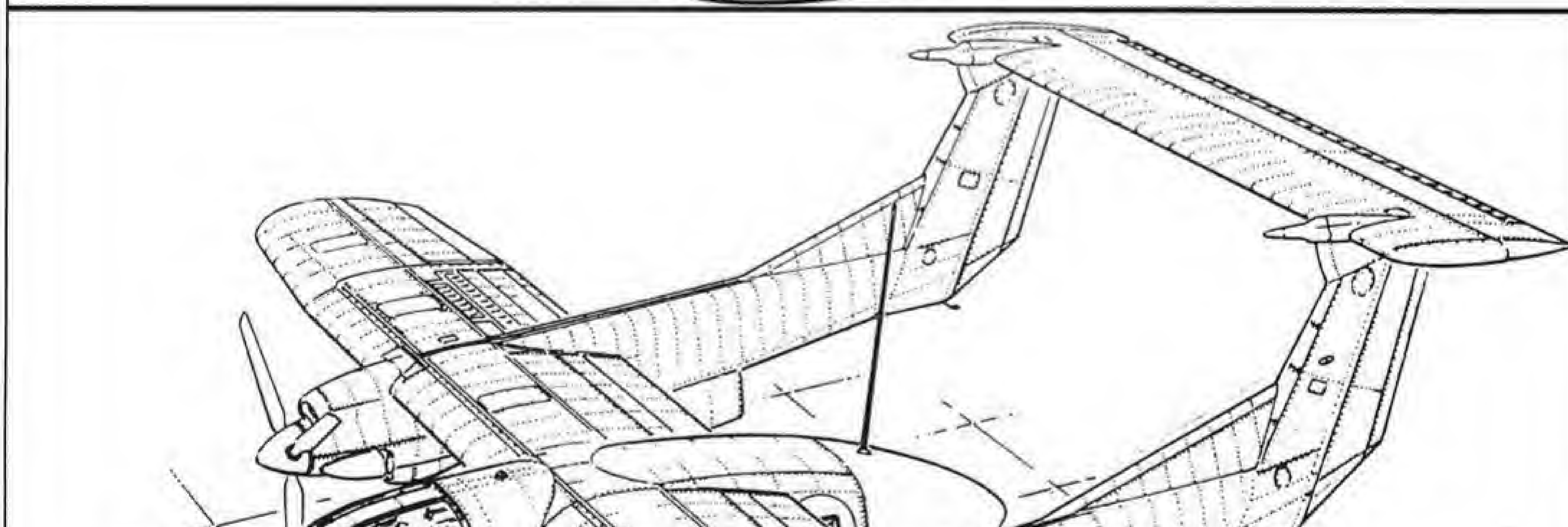
The passenger door simplifies loading and unloading passengers and small cargo items, and also serves as a jump door for paratrooper missions. Included in the hinged tail cone are twin ramps to speed the loading of a jeep or other wheeled vehicles or equipment. A further advantage of the tail cone is that it may be swung aside, allowing a truck to back between the aircraft tail booms and load or unload directly from the cargo compartment.. The tail cone can be modified into a rear-opening door for paratroop or cargo airdrop missions.



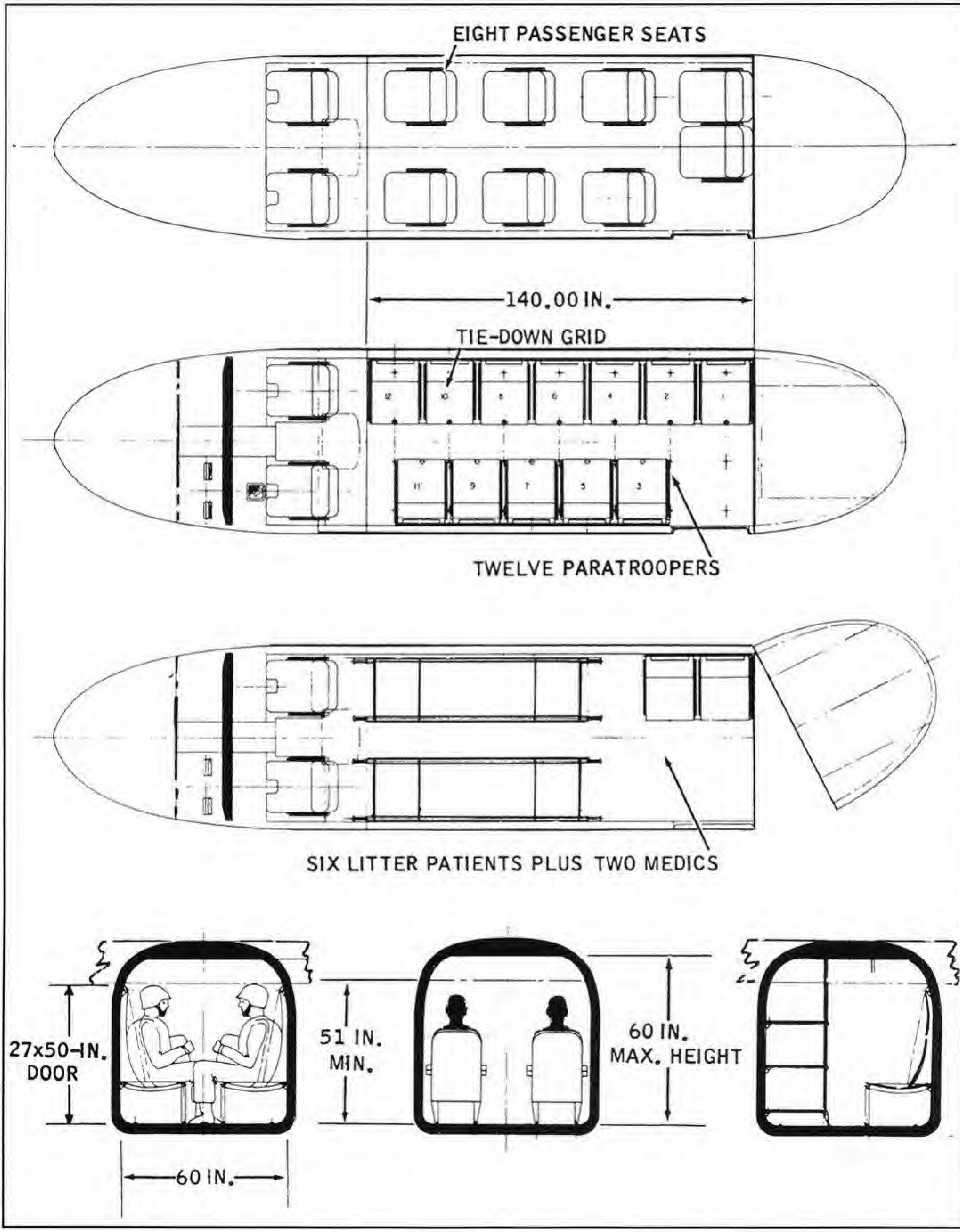
The 60 by 140 inch cargo floor includes provisions for track-mounted seats and a cargo tie-down grid. Thus, the fuselage can be fitted with eight standard passenger seats, seats for twelve fully equipped paratroopers, six litter patients and two medics, or a tie-down arrangement for a full cargo load.

Side-by-side seats in the cockpit are provided for the copilot, engineer or additional passenger.

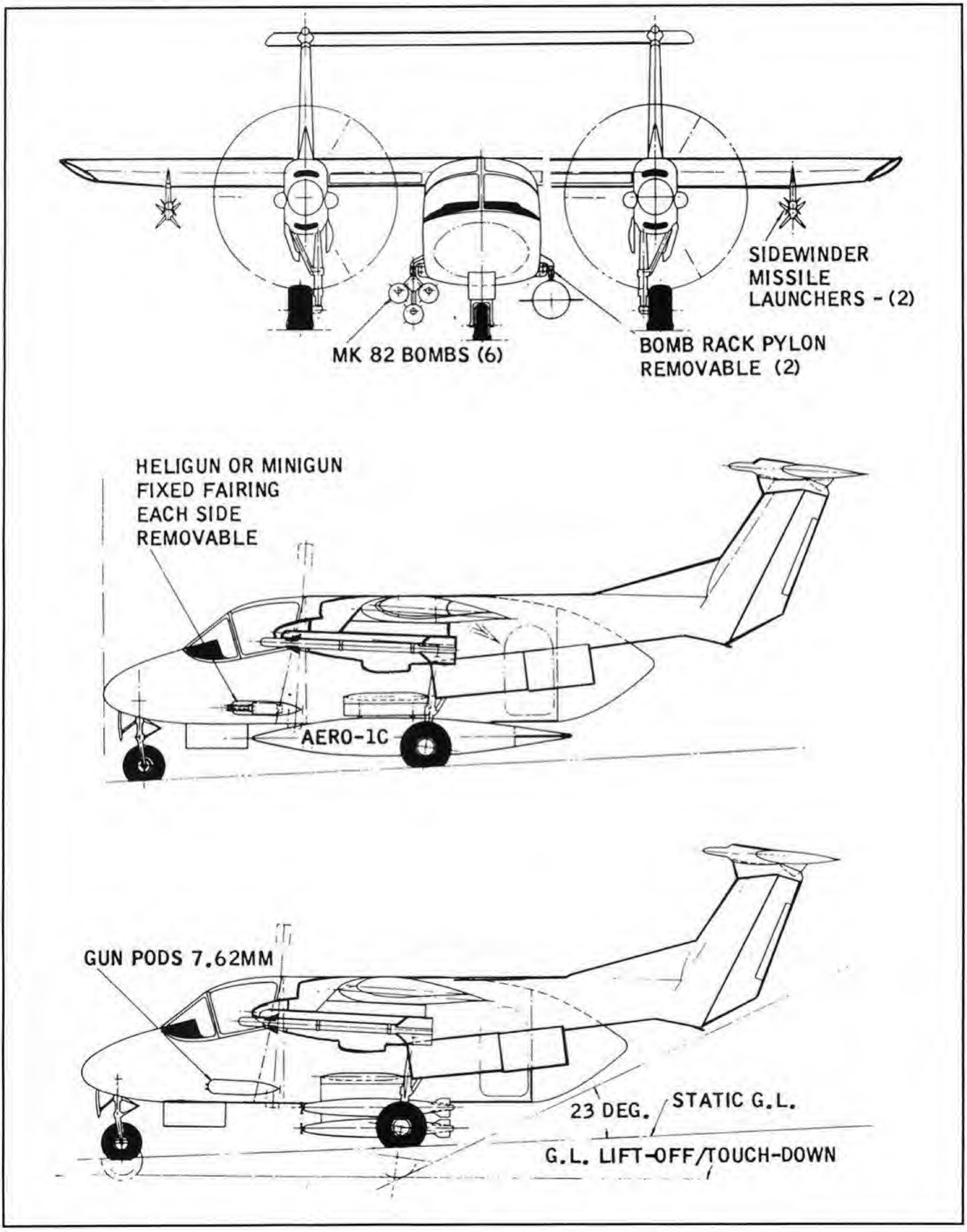


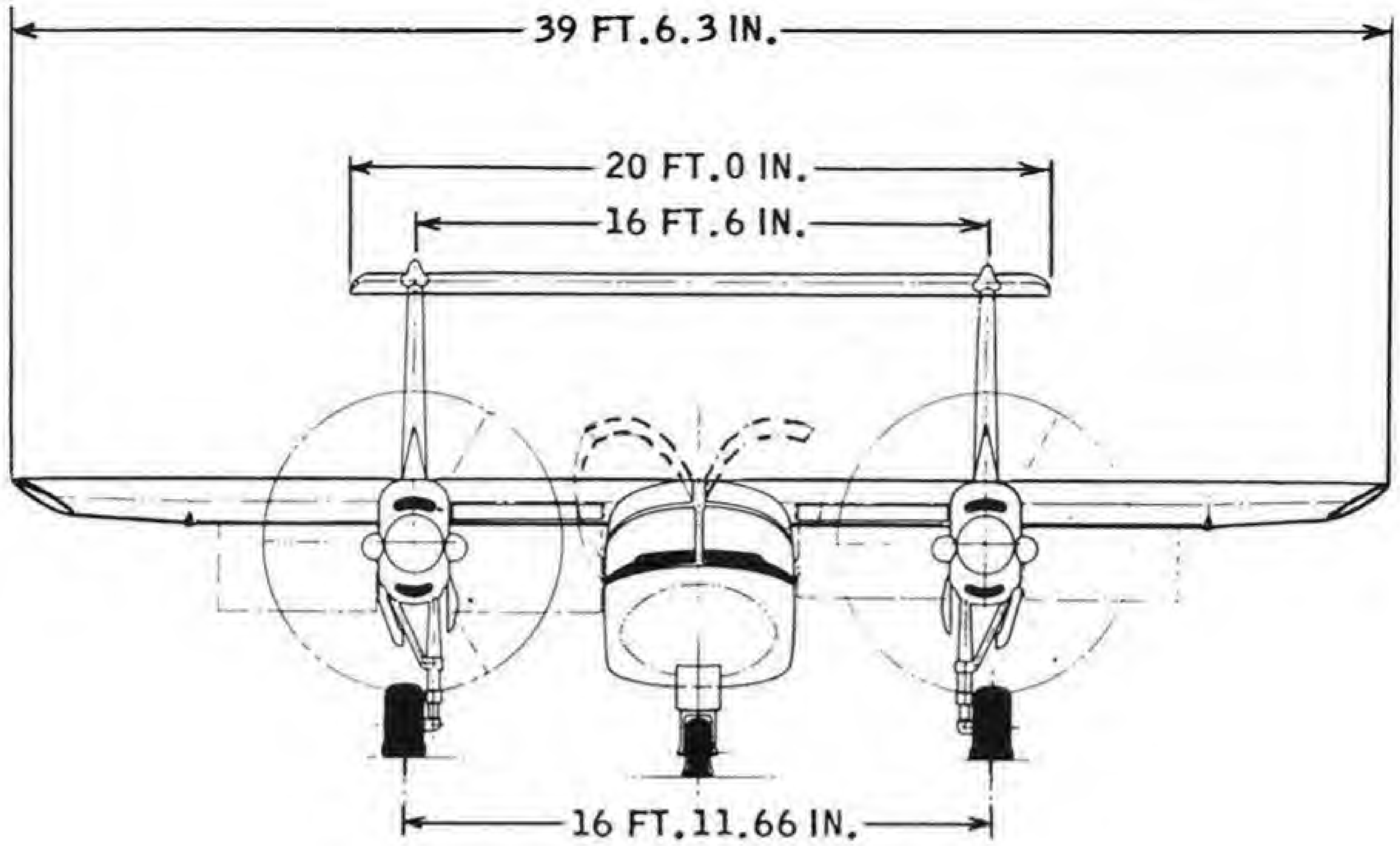


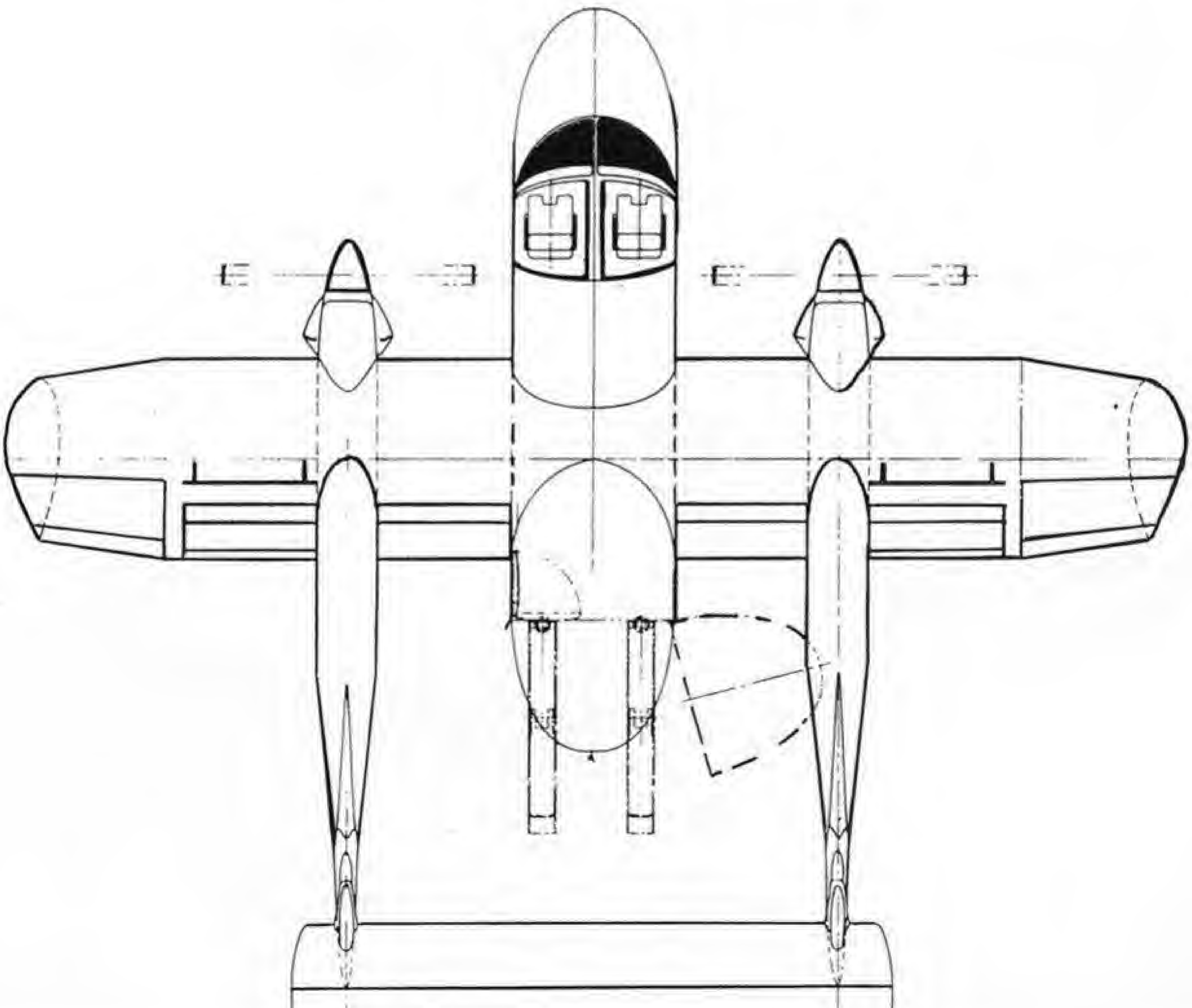
INTERIOR ARRANGEMENT



LIGHT TRANSPORT GENERAL ARRANGEMENT



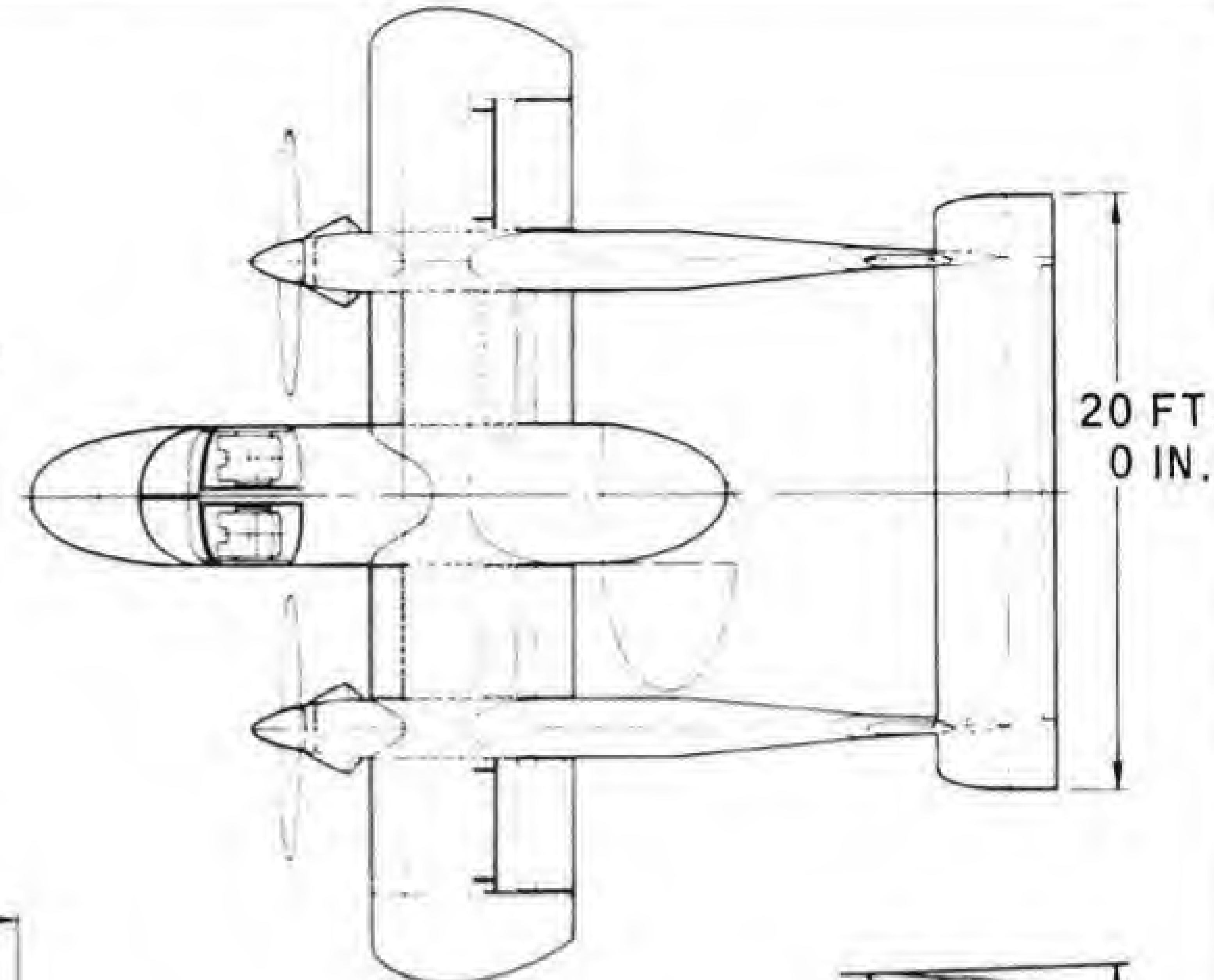

39 FT. 6.3 IN.
20 FT. 0 IN.
16 FT. 6 IN.
16 FT. 11.66 IN.

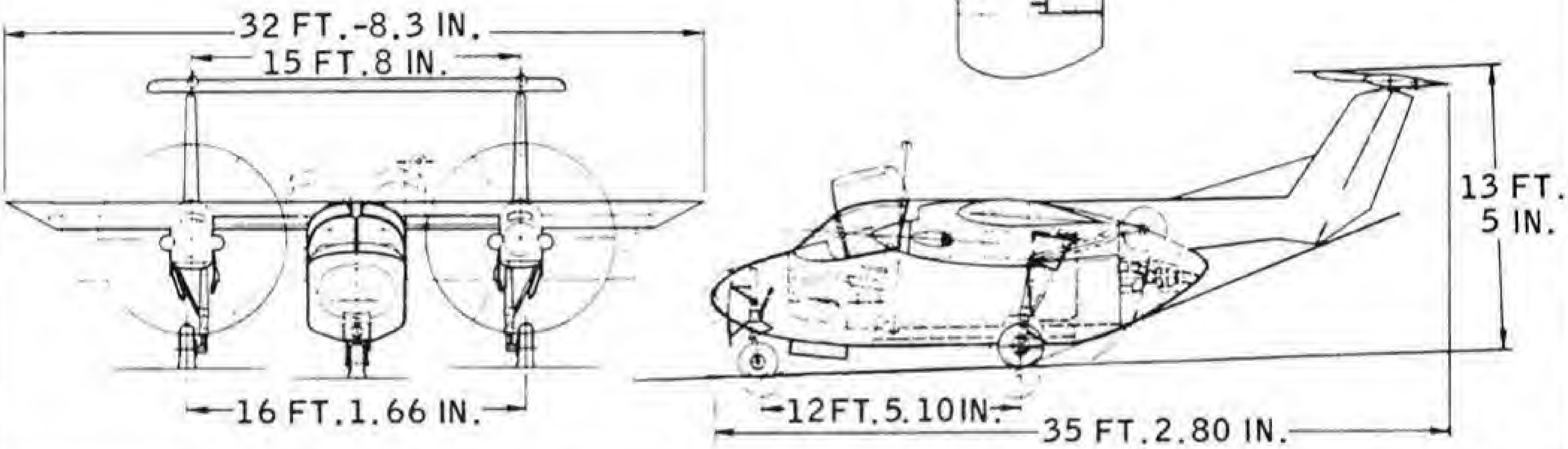


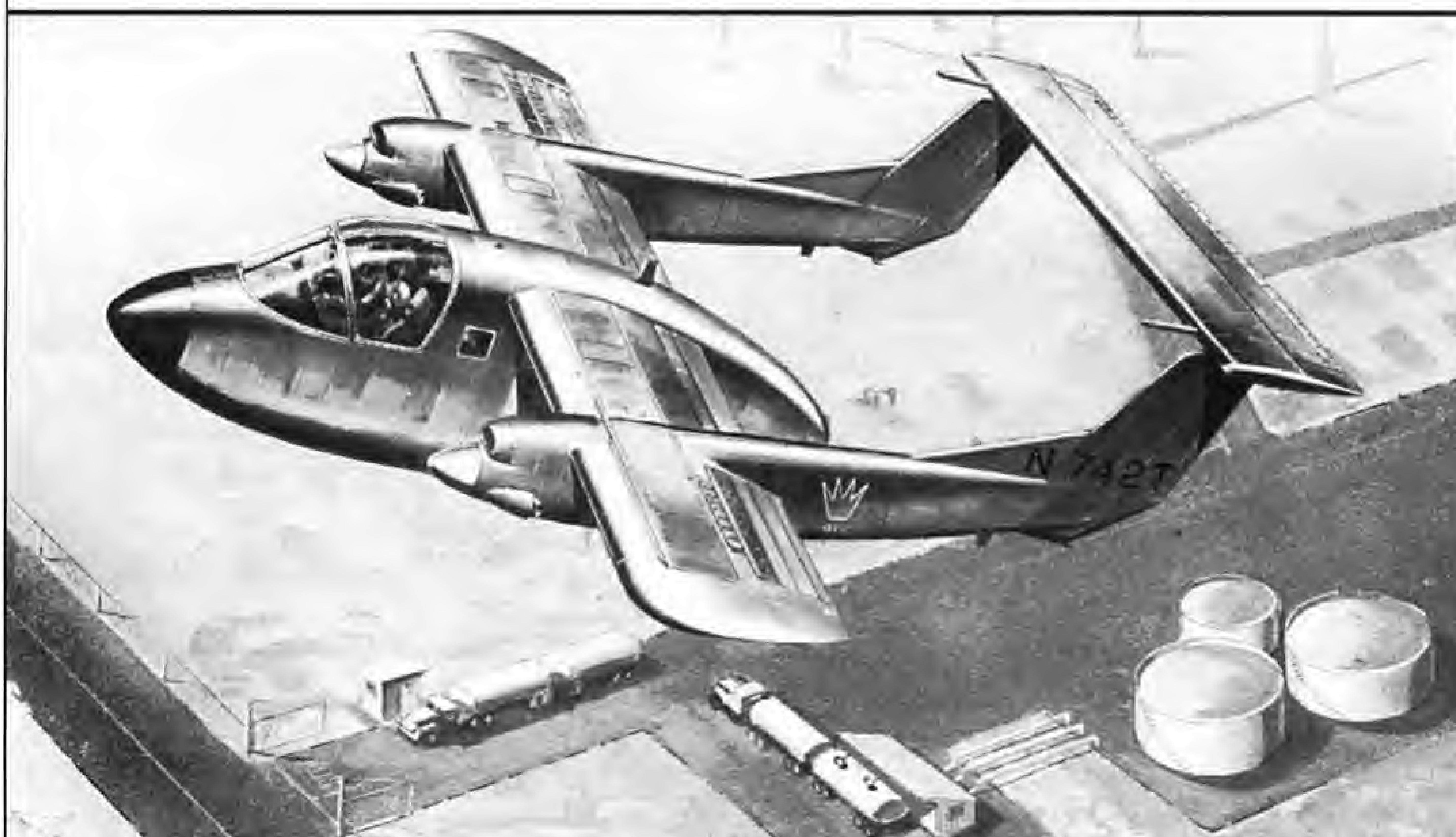
CONVAIR ROUGHNECK CIVIL TRANSPORT

GENERAL ARRANGEMENT

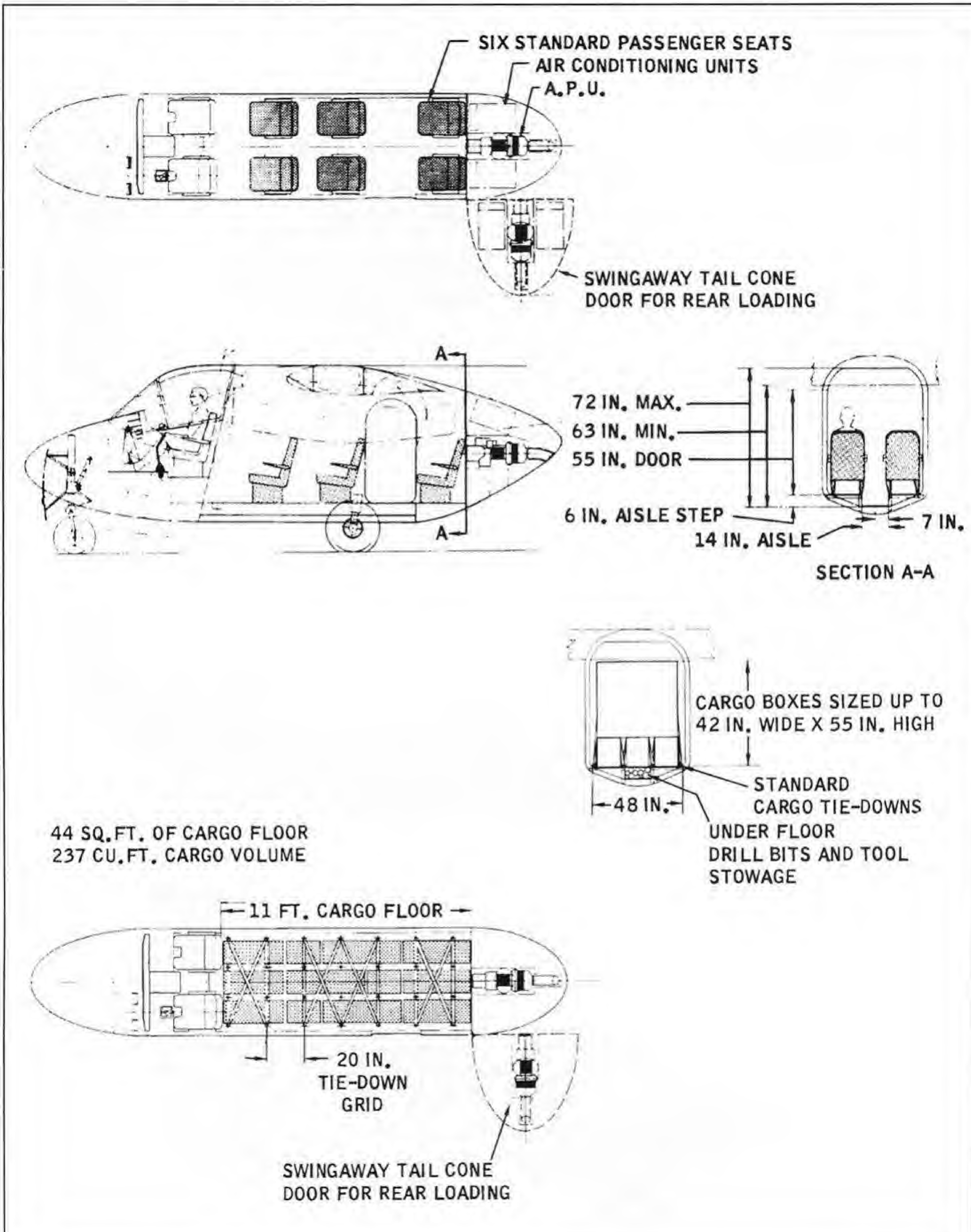
Engines:	United Aircraft of Canada PT6 turboprop, 700 shp
Propellers:	Hamilton-Standard Three-bladed, 8.5 ft. diameter LH opposite-rotation







ROUGHNECK INTERIOR ARRANGEMENT AND LANDING

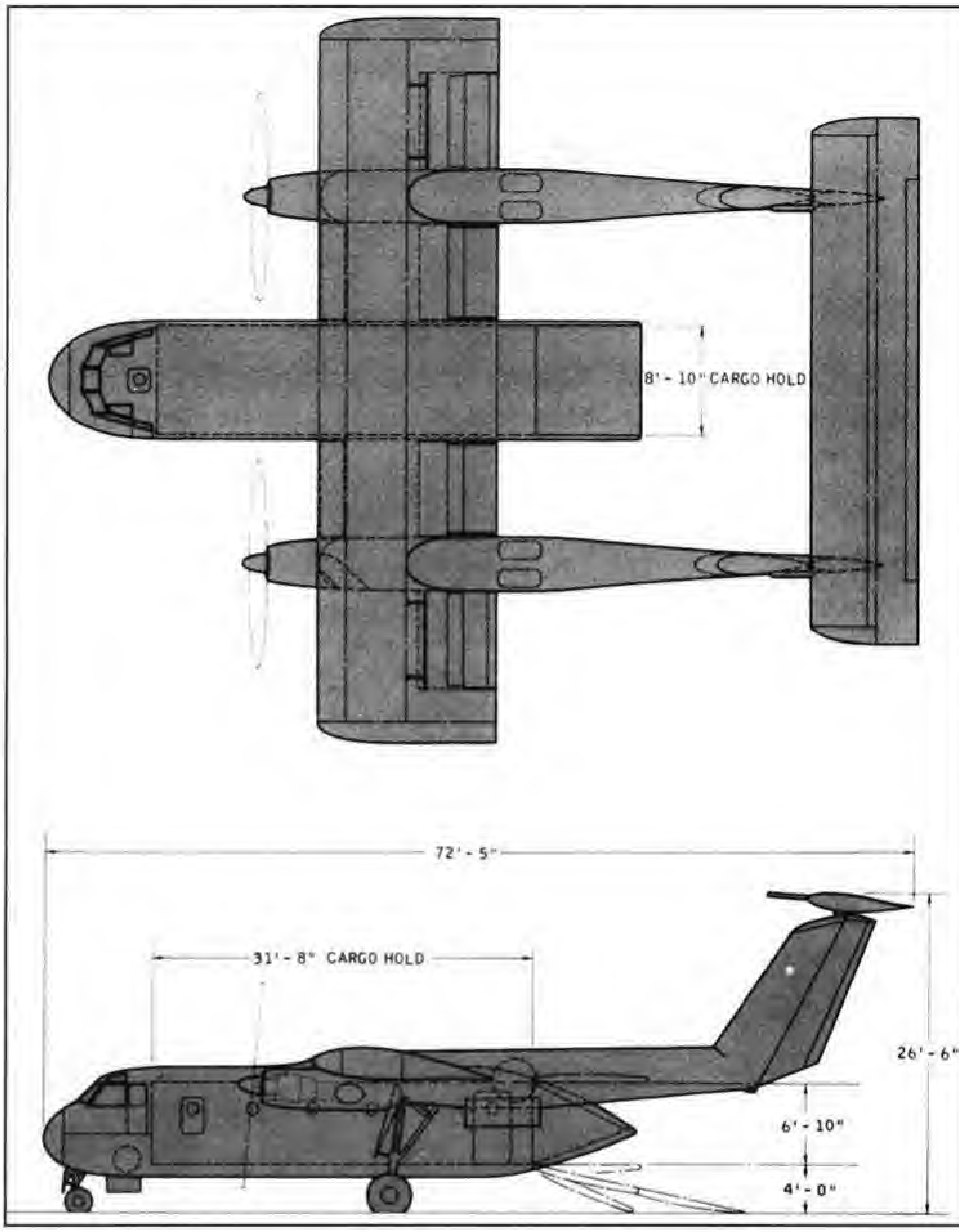


CST, CLOSE SUPPORT TRANSPORT

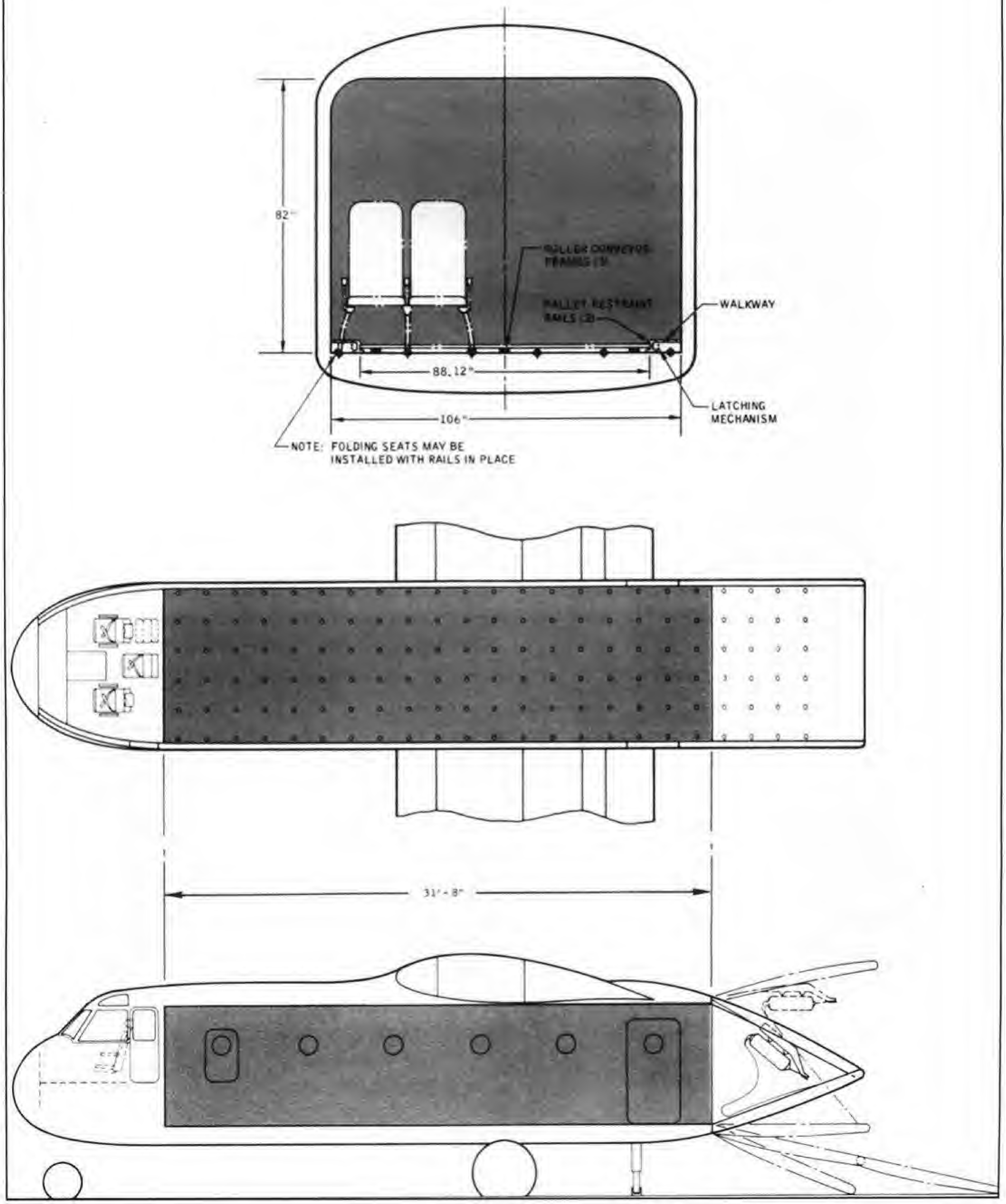
Configuration of the Convair CST was based on the aerodynamic layout of the Model 48. By enlarging the Model 48 airplane to roughly twice the size and adding a simple cargo fuselage shape, Convair achieved a transport configuration very similar to its light armed reconnaissance airplane with the same STOL performance.

The floor of the cargo compartment was to have a standard 20X20 inch grid pattern of tie-down points, and the forward part of the loading ramp was to be fitted with a similar grid for additional loading. A pair of ramp extensions used in loading and unloading wheeled vehicles from the ground were to be stowed in the upper door. Total internal volume was to be 1,910 cubic feet. Floor area was to be 280 square feet.

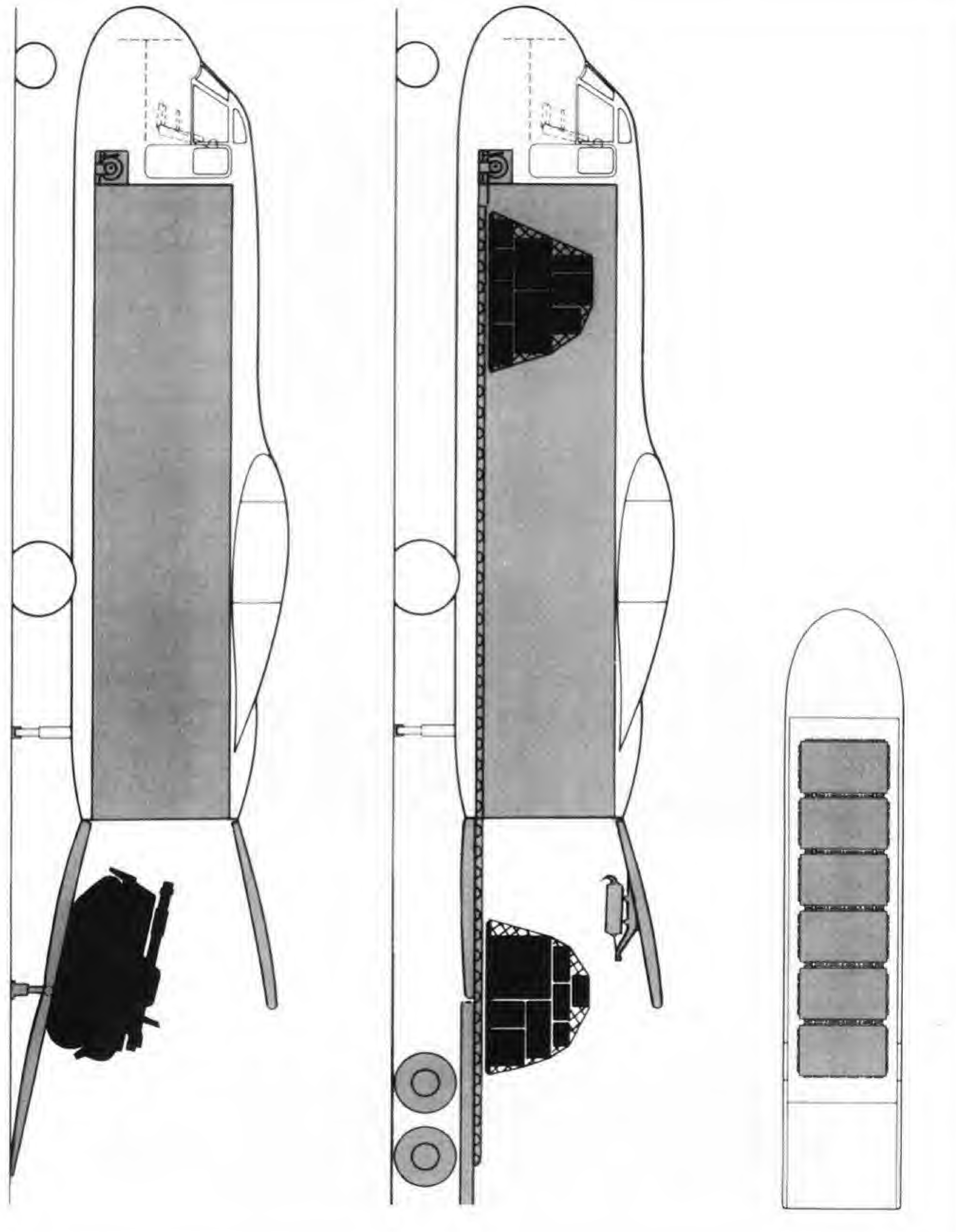
The crew would enter the airplane through a door on the left side of the flight deck or through the cargo compartment. A 36X72 inch door was to be located in the aft end of the cargo compartment on either side for use in paratroop drops. The loading ramp was designed to be dropped to the ground without extensions, allowing passengers and crew to walk in.



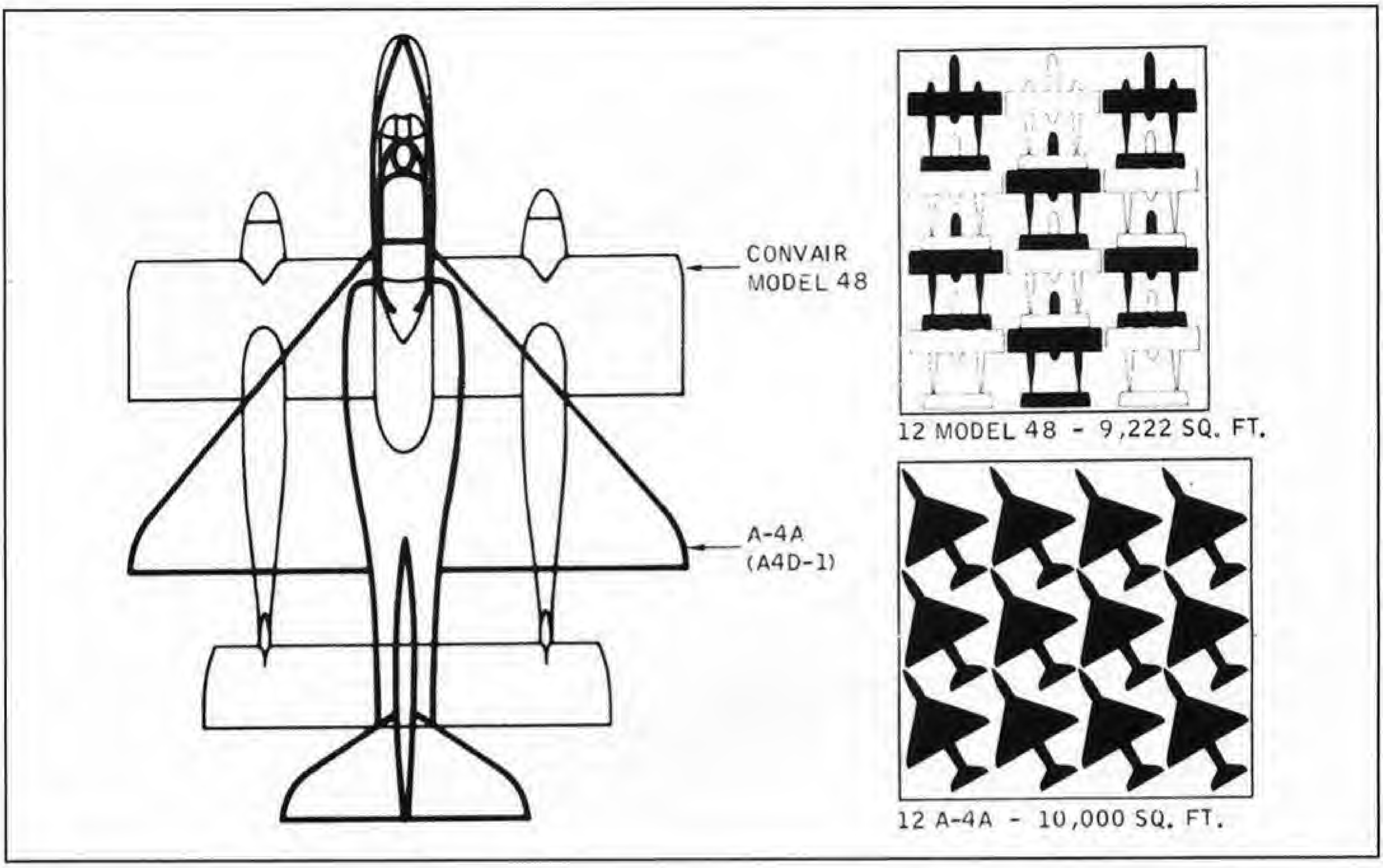
CST INTERIOR ARRANGEMENT



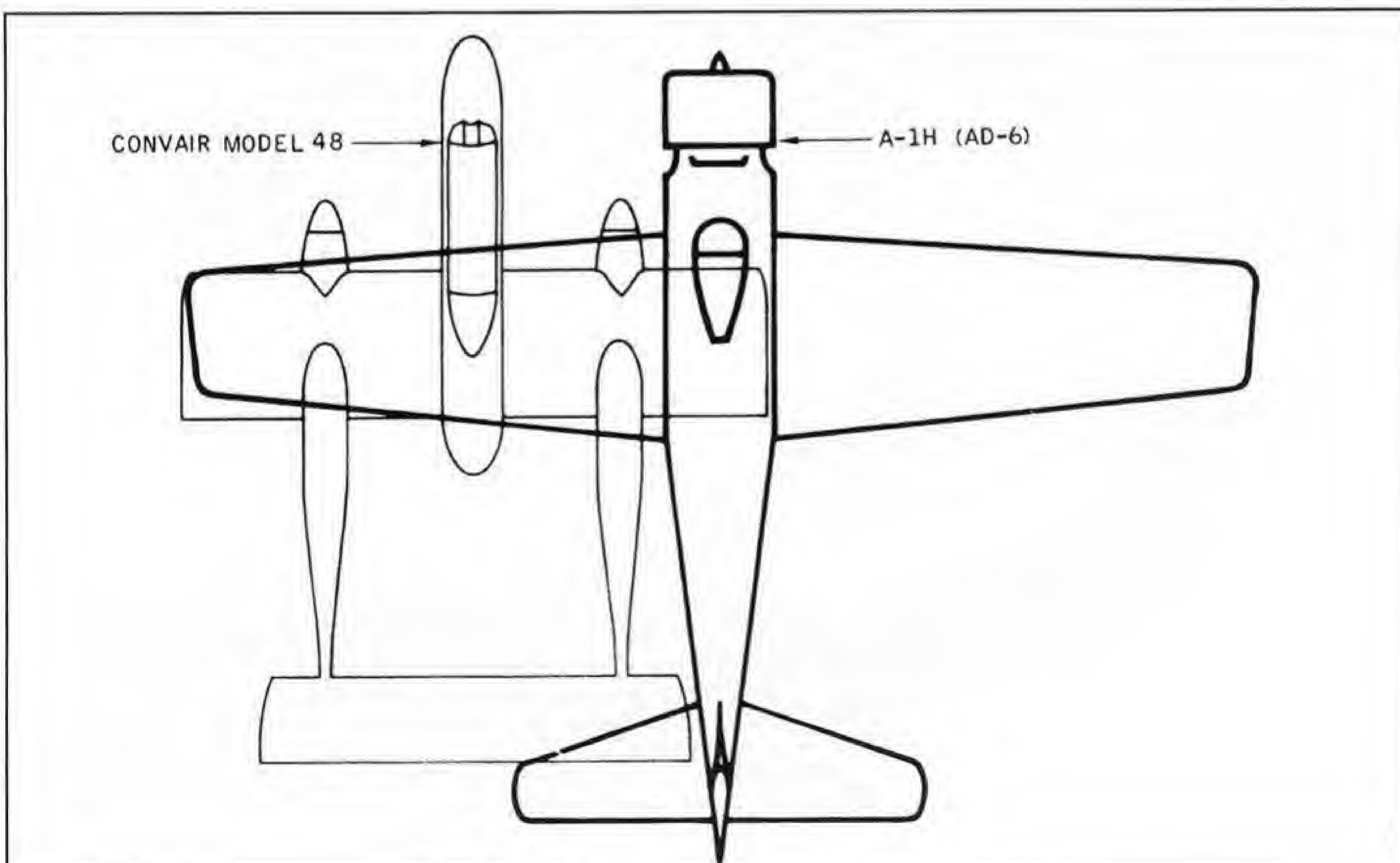
CST PALLET AND RAMP LOADING



A-4A SKYHAWK SIZE COMPARISON, CARRIER OPERATIONS



A-1H SKYRAIDER SIZE COMPARISON, LIMITED WAR



LARGE FACTORY DISPLAY MODELS

Convair created many different factory models in all proposal versions and sizes. I picked what I felt were the three best examples of the initial prototype (at right, via Jim Fink in US Marines markings), the modified flight prototype (below as given to Howie Auten), and the longer, sleeker production proposal (bottom, 3-foot model via San Diego Aerospace Museum). Note wing Sidewinders and fuselage triple ejector racks and bombs on the production model below. Also, the nose gear was to be fully retractable.

Above, artists illustration of one of the Charger proposals, a model of this proposal is seen below. Below, four different Convair models with a approximate replica of the original prototype in the foreground. (via Jim Fink)


N28K
CONVAIR
Charger
MODEL 48